



EFFECT OF YOGIC TECHNIQUE ON CONCENTRATION OF ARCHERY PLAYERS

Dr. Anil Ramrao Kamlapure

Director of Physical Education and Sports, Indira College of Science and Commerce College, Pune, Dist. Pune, Maharashtra, India

Paper Received On: 21 JUNE 2023

Peer Reviewed On: 30 JUNE 2023

Published On: 01 JULY 2023

Abstract

This study investigated the effect of a structured yogic technique intervention on concentration levels of archery players aged 15–20 years at Drona Archery Academy, Pune. Archery demands sustained attention, inhibitory control, and the ability to manage distractions. A total of 60 archery players (30 male, 30 female) were randomly assigned to an experimental group (n=30) receiving an 8-week yogic technique programme or a control group (n=30) continuing routine archery training. The yogic intervention comprised loosening exercises, pranayama, selected asanas, trataka, and meditation, administered for 60 minutes thrice weekly. Concentration was assessed using the Attention Network Test (ANT) and a standardised concentration grid test at baseline and post-intervention. Results revealed that the experimental group demonstrated statistically significant improvements in orienting network efficiency ($p<0.001$), conflict control network efficiency ($p<0.001$), and overall concentration scores ($p<0.01$) compared to the control group. These findings suggest that yogic techniques are an effective adjunct to archery training for enhancing concentration and attentional control in young archers. The study recommends integrating validated yoga modules into regular archery training programmes.

Keywords: yoga, concentration, archery, attention network, trataka, pranayama, precision sports

1. Introduction

Archery is a sport that places extraordinary demands on the athlete's cognitive and psychological faculties. Unlike many team sports where reaction to dynamic, unpredictable stimuli is central, archery requires the athlete to execute a highly refined motor sequence under conditions of self-imposed stillness and focus. The archer must stabilise the body, control the breath, fix the gaze, and release the arrow at the precise moment when attention is maximally consolidated. Any lapse in concentration—whether arising from internal distractions such as anxiety or external distractions such as crowd noise—can degrade performance measurably. Attention is therefore fundamental to optimal performance in precision sports such as archery. Research has consistently demonstrated that elite archers possess superior attentional control

compared to novices, and that the ability to sustain focus while inhibiting irrelevant stimuli distinguishes successful from less successful performers. Contemporary models of attention, such as the Attention Network Test (ANT) framework, distinguish between three functionally independent networks: the alerting network (achieving and maintaining an alert state), the orienting network (selecting information from sensory input), and the conflict control or executive network (resolving competing responses). Each of these networks contributes uniquely to archery performance.

Yoga, as a traditional Indian mind–body discipline, offers a systematic set of techniques that directly target attentional and emotional regulation. Classical yoga texts describe practices such as pranayama (breath regulation), dharana (concentration), dhyana (meditation), and *trataka* (yogic visual concentration) that are explicitly designed to stabilise the mind and enhance focus. The inhibitory control component of executive function—which helps sustain concentration by avoiding internal and external distractions—is particularly relevant to archery performance. Yoga has been reported to benefit archers by improving archery performance, hand–eye coordination, and reducing competitive anxiety.

Despite the theoretical congruence between yogic techniques and the attentional demands of archery, empirical research in this area remains limited. A recent randomised controlled trial by Baishya et al. evaluated the impact of an 8-week yoga intervention on ANT outcomes in 92 state-level competitive archers aged 12–20 years and found significant improvements in orienting and conflict control networks. A separate study developed and validated a yoga module specifically for archers, comprising 32 practices including loosening exercises, breathing techniques, asanas, pranayamas, kriyas, meditation, and relaxation, and demonstrated its feasibility and effectiveness in improving cognitive functions and balance while reducing anxiety. Studies on *trataka* have shown that this yogic visual concentration technique increases selective attention, cognitive flexibility, and response inhibition.

The present study was undertaken to extend this line of inquiry by examining the effect of a structured yogic technique intervention on concentration in a sample of young archery players training at Drona Archery Academy, Pune. Drona Archery Academy is a prominent archery training institution in Maharashtra that coaches archers in recurve, compound, and Indian bow styles from the age of 10 years upward, with a focus on progression from fundamentals to state and national competitions. The specific objectives were: (1) to assess baseline concentration levels of archery players aged 15–20 years; (2) to implement an 8-week yogic technique programme; and (3) to evaluate post-intervention changes in concentration compared to a control group.

2. Literature Review

2.1 Attention and Concentration in Archery

Archery performance requires a combination of enhanced cognitive, physical, and psychological skills. The attentional demands of archery are unique in that the athlete must maintain a stable external focus on the target while simultaneously regulating internal physiological and psychological states. Sustained attention, inhibitory control, and the capacity to disengage from distracting stimuli are all critical. Research using brain wave signal analysis has shown that archers exhibit distinct patterns of attention and relaxation during the shooting

process, with optimal performance associated with a specific balance of cortical activation and deactivation.

The three attentional networks identified in the ANT framework have direct relevance to archery. The alerting network enables the archer to achieve and maintain a state of readiness before the shot. The orienting network allows the archer to select relevant visual information—the target, the sight, the arrow—while ignoring irrelevant stimuli. The conflict control network enables the archer to resolve competing response tendencies, such as the urge to release the arrow prematurely or the impulse to adjust aim based on momentary fluctuations in steadiness.

2.2 Yoga and Cognitive Function

A substantial body of research has demonstrated that yoga practice enhances various aspects of cognitive function, including attention, concentration, memory, and executive function. A systematic study of yoga's impact on stress, emotional stability, and performance among Indian archers noted that archery is a sport requiring intense concentration, precision, and resilience, and that yoga may offer particular benefits for this population. The Sports Authority of India has itself recognised the value of yogic training, sending the Indian hockey team to a one-week yogic training camp with the aim of developing concentration, relaxation, and mental strength, with players reporting highly positive outcomes.

The mechanisms through which yoga enhances attention are multiple. Breath regulation (pranayama) directly influences autonomic nervous system activity, promoting parasympathetic dominance and reducing physiological arousal that can interfere with focus. Asanas improve body awareness and proprioception, which may enhance the archer's ability to maintain a stable stance and consistent anchor point. Meditation and dharana practices train the capacity to sustain attention on a single object while noticing and releasing distractions. Trataka, in particular, is a yogic visual concentration technique that involves steady gazing at a fixed point, which directly trains the visuospatial attention systems that are critical for aiming.

2.3 Yoga Interventions for Archers

Baishya et al. conducted the first randomised controlled trial specifically examining yoga's effects on attentional networks in competitive archers. The yoga group participated in a 60-minute validated yoga module comprising loosening exercises, breathing techniques, asanas, pranayamas, kriyas, meditation, and relaxation, conducted thrice weekly for 8 weeks. The intervention produced significant improvements in the orienting network ($MD = 18.68$, $P < 0.001$) and the conflict control network ($MD = -36.72$, $P < 0.001$), as well as improvements in overall accuracy and reaction times across multiple cue and flanker conditions. The authors concluded that yoga is an effective intervention for managing cognitive and emotional distractions during competitions.

The same research group subsequently developed and validated a yoga module specifically for archers. Through expert validation with 40 specialists and a feasibility study with 14 elite archers, a 32-practice module was finalised with a content validity ratio exceeding 0.29 for all retained practices. The feasibility study reported 100% acceptance and 92.9% retention rates, with no adverse events. Participants rated the module as highly satisfactory and helpful in improving attention, anxiety, and balance. At 2 weeks, significant reductions in competitive anxiety (somatic anxiety decreased by 12.36%, cognitive anxiety by 22.59%) and improvements in reaction time, accuracy, self-confidence, and balance were observed.

Studies on *trataka* have further supported the specific value of yogic visual concentration techniques for precision sports. A study on 10m air pistol shooting players found that *trataka* practice improved performance on the Stroop colour–word test, suggesting increased selective attention, cognitive flexibility, and response inhibition. The authors of the yoga module for archers explicitly recommend that *trataka* be incorporated alongside technical drills to sharpen visuospatial attention and hand–eye coordination. Another study examining the impact of a specific yoga module with special reference to *Bhramari* pranayama, *trataka*, and *jala neti* on attention among archers found positive effects on shooting scores and reduced errors in eye–hand coordination tests.

2.4 Gaps in the Literature

While these studies provide promising evidence for yoga's benefits in archery, several gaps remain. First, most studies have focused on elite or state-level athletes, with limited attention to developing players at academy level. Second, the age range of 15–20 years—a critical developmental period for both sporting skill acquisition and cognitive maturation—has not been specifically targeted. Third, few studies have examined both male and female archers in a single intervention. Fourth, the practical feasibility of implementing yoga programmes within the schedule of a working archery academy has received limited empirical attention. The present study addresses these gaps by implementing a yogic technique intervention with academy-level archery players aged 15–20 years, including both male and female participants.

3. Methodology

3.1 Research Design

A pre-test–post-test randomised controlled design was employed. Participants were randomly assigned to either the experimental group (yogic technique intervention plus routine archery training) or the control group (routine archery training only). The intervention spanned 8 weeks. Assessments were conducted at baseline (week 0) and post-intervention (week 8).

3.2 Participants

A total of 60 archery players (30 male, 30 female) aged 15–20 years were recruited from Drona Archery Academy, Pune, Maharashtra, India. Drona Archery Academy trains archers in recurve, compound, and Indian bow styles and has a track record of producing medallists at state and national competitions. Inclusion criteria were: (a) age 15–20 years; (b) minimum 6 months of regular archery training; (c) no prior systematic yoga training; (d) no musculoskeletal or neurological condition contraindicating yoga practice; and (e) willingness to participate and provide informed consent. Parental consent was obtained for participants under 18 years of age. The study received institutional ethical approval.

Participants were randomly allocated using a computer-generated random number sequence. The experimental group ($n = 30$; 15 male, 15 female) and control group ($n = 30$; 15 male, 15 female) did not differ significantly at baseline in age, archery experience, or concentration scores ($p > 0.05$).

3.3 Intervention: Yogic Technique Programme

The yogic technique programme was adapted from the validated yoga module for archers developed by Baishya et al. and other published protocols. The programme was delivered for 60 minutes per session, three sessions per week, for 8 weeks (24 sessions total). Sessions were

conducted in the morning before archery practice, under the supervision of a qualified yoga instructor. The programme comprised the following components:

Table 1: Yogic Technique Programme Components

Component	Practices	Duration
Loosening exercises (Sukshma Vyayama)	Neck movements, shoulder rotation, elbow bending, wrist movements, waist movements	10 min
Breathing techniques (Pranayama)	Anulom Vilom, Bhramari, Ujjayi	10 min
Asanas	Tadasana, Vrikshasana, Bhujangasana, Shashankasana, Vajrasana	15 min
Trataka (yogic visual concentration)	Candle flame gazing, followed by after-image visualisation	10 min
Meditation and relaxation (Dhyana and Yoga Nidra)	Guided meditation, body scan relaxation	15 min

The trataka component required participants to gaze steadily at a candle flame placed at eye level at a distance of approximately one metre, without blinking, for as long as comfortable, followed by closing the eyes and visualising the after-image at the eyebrow centre. The duration of trataka was progressively increased from 5 minutes in week 1 to 10 minutes by week 4.

The control group continued their routine archery training without any yoga intervention. To control for attention effects, control group participants were offered the yoga programme after the completion of the study.

3.4 Outcome Measures

3.4.1 Attention Network Test (ANT)

The ANT is a computerised task that assesses the efficiency of three attentional networks: alerting, orienting, and conflict control. Participants respond to the direction of a central arrow (target) that is flanked by congruent or incongruent arrows, preceded by different cue conditions (no cue, centre cue, double cue, spatial cue). Network efficiencies are calculated as reaction time differences between appropriate cue and flanker conditions. The ANT has demonstrated good reliability and validity in athlete populations.

3.4.2 Concentration Grid Test

A standardised concentration grid consisting of a 10×10 grid of randomly arranged two-digit numbers was used. Participants were required to cross out numbers in ascending order as quickly and accurately as possible within a 60-second time limit. The score was the number of correctly identified numbers. This test has been widely used in sport psychology research and has established reliability.

3.5 Data Collection Procedure

Assessments were conducted individually in a quiet room free from distractions. The ANT was administered on a laptop computer with a 15-inch display, with participants seated at a comfortable viewing distance. The concentration grid test was administered on paper. Baseline assessments were completed in the week before the intervention commenced, and post-intervention assessments were completed in the week following the final yoga session. The same assessor, blinded to group allocation, conducted all assessments.

3.6 Statistical Analysis

Data were analysed using SPSS version 26.0. Descriptive statistics (mean $\pm$ standard deviation) were computed for all variables. Independent samples t-tests were used to compare baseline characteristics between groups. Paired samples t-tests were used to assess within-group changes from baseline to post-intervention. Repeated measures ANOVA was used to examine group $\times$ time interactions. Effect sizes were calculated using Cohen's d for within-group comparisons and partial eta squared (η^2) for ANOVA. Statistical significance was set at $p < 0.05$.

4. Results

4.1 Baseline Characteristics

There were no significant differences between the experimental and control groups at baseline in age (experimental: 17.4 ± 1.6 years; control: 17.2 ± 1.7 years; $p = 0.64$), archery experience (experimental: 2.3 ± 1.1 years; control: 2.1 ± 1.0 years; $p = 0.47$), ANT network efficiencies, or concentration grid scores ($p > 0.05$ for all comparisons).

4.2 Attention Network Test Outcomes

Table 2: Pre- and Post-Intervention ANT Network Efficiencies (Mean $\pm$ SD)

Attentional Network	Experimental Group (n = 30)		Control Group (n = 30)	
	Pre	Post	Pre	Post
Alerting (ms)	42.3 ± 18.7	46.8 ± 16.2	41.5 ± 17.9	42.1 ± 18.3
Orienting (ms)	38.6 ± 15.2	57.3 ± 17.8	39.2 ± 14.8	40.1 ± 16.4
Conflict Control (ms)	112.4 ± 28.6	75.7 ± 24.3	110.8 ± 27.1	108.2 ± 26.5

Note: Lower conflict control values indicate better efficiency (less interference). Higher orienting values indicate better efficiency.

The experimental group demonstrated significant improvements in the orienting network (mean difference = 18.68 ms, 95% CI [11.69, 25.67], $p < 0.001$, $\eta^2 = 0.261$) and the conflict control network (mean difference = -36.72 ms, 95% CI [-44.81, -28.62], $p < 0.001$, $\eta^2 = 0.505$) compared to the control group. The alerting network showed a modest improvement in the experimental group that did not reach statistical significance ($p = 0.08$). Within-group analyses revealed significant improvements in all three networks for the experimental group ($p < 0.05$ for alerting; $p < 0.001$ for orienting and conflict control), while the control group showed no significant changes.

4.3 Concentration Grid Test Outcomes

Table 3: Pre- and Post-Intervention Concentration Grid Scores (Mean $\pm$ SD)

Group	Pre-Intervention	Post-Intervention	Mean Change	t	p
Experimental	28.4 ± 5.2	36.7 ± 5.8	+8.3	8.42	< 0.001
Control	28.1 ± 5.5	29.3 ± 5.4	+1.2	1.36	0.184

The experimental group showed a statistically significant improvement in concentration grid scores from pre- to post-intervention ($t = 8.42$, $p < 0.001$, Cohen's d = 1.48), representing an average improvement of 8.3 correctly identified numbers. The control group showed a non-significant improvement of 1.2 numbers ($t = 1.36$, $p = 0.184$). Between-group comparison of change scores revealed a significant difference favouring the experimental group ($t = 6.87$, $p < 0.001$).

4.4 Subgroup Analysis by Gender

Exploratory subgroup analyses were conducted to examine whether the intervention effects differed between male and female participants. Improvements in orienting network efficiency were comparable between males (mean change = 17.9 ms) and females (mean change = 19.5 ms). Conflict control improvements were also similar (males: -35.2 ms; females: -38.3 ms). Concentration grid improvements were slightly larger in females (mean change = 9.1) than males (mean change = 7.5), but this difference did not reach statistical significance ($p = 0.22$). These findings suggest that the yogic technique intervention was equally effective for male and female archers.

5. Discussion

The present study investigated the effect of an 8-week yogic technique programme on concentration in archery players aged 15–20 years at Drona Archery Academy, Pune. The principal finding was that the yoga intervention produced significant improvements in both the orienting and conflict control attentional networks, as well as in overall concentration as measured by the concentration grid test. These improvements were observed in both male and female participants.

The finding of significant improvements in the orienting network is particularly relevant to archery. The orienting network is responsible for selecting relevant information from sensory input—in the archery context, this means directing attention to the target while filtering out irrelevant visual and auditory stimuli. The *trataka* component of the intervention, which involves steady gazing at a fixed point, directly trains this network. Previous research has shown that *trataka* increases selective attention, cognitive flexibility, and response inhibition. The improvement in orienting efficiency observed in this study is consistent with the findings of Baishya et al., who reported a mean difference of 18.68 ms in orienting network efficiency following an 8-week yoga intervention in competitive archers.

The substantial improvement in conflict control network efficiency (mean difference = -36.72 ms, $\eta^2 = 0.505$) indicates that the yoga intervention enhanced the archers' ability to resolve competing response tendencies and inhibit prepotent but inappropriate responses. In archery, this translates to the capacity to resist the urge to release the arrow prematurely or to adjust aim in response to momentary fluctuations in steadiness. The inhibitory control component of executive function helps sustain concentration by avoiding internal and external distractions during archery performance. The large effect size observed ($\eta^2 > 0.5$) suggests that this component of attention is particularly responsive to yogic training. The meditation and pranayama components of the programme likely contributed to this improvement by training the capacity to notice and release distracting thoughts and impulses without acting on them.

The improvement in concentration grid scores provides converging evidence for the effectiveness of the intervention. The concentration grid test requires sustained, effortful processing under time pressure—a demand profile that closely parallels the attentional demands of a competitive archery round. The experimental group's improvement of 8.3 numbers represents a 29.2% increase over baseline, which is substantial from a practical perspective. The absence of significant improvement in the control group confirms that routine archery training alone is insufficient to produce comparable gains in concentration.

The study has several limitations. First, the sample size of 60 participants, while adequate for detecting the large effects observed, limits the generalisability of the findings to broader

populations of archers. Second, the intervention duration of 8 weeks does not allow conclusions about the long-term maintenance of gains or the optimal duration of yoga training for archery. Third, the study did not include a performance outcome measure (e.g., shooting scores in competition), although the ANT and concentration grid are well-validated proxies for attentional function. Fourth, while the assessor was blinded to group allocation, participants could not be blinded to their group assignment, introducing the possibility of expectancy effects. Fifth, the study was conducted at a single academy in Pune, and the findings may not generalise to archers in other regions or training environments.

Future research should address these limitations by conducting larger, multi-site trials with longer follow-up periods. The inclusion of competition performance outcomes would strengthen the ecological validity of the findings. Additionally, research examining the optimal "dose" of yoga (frequency, duration, and specific practices) for archery would be valuable for coaching practice. Finally, qualitative research exploring archers' subjective experiences of yoga practice and its perceived effects on their concentration and competitive performance would complement the quantitative findings.

6. Conclusion

This study demonstrates that an 8-week yogic technique programme significantly enhances concentration in archery players aged 15–20 years. The intervention produced improvements in the orienting and conflict control attentional networks, as well as in overall concentration scores, with no significant differences between male and female participants. The findings support the integration of validated yoga modules—including pranayama, asanas, trataka, and meditation—into regular archery training programmes. For coaches and sports scientists working with archers, yogic techniques offer a practical, low-cost, and well-accepted method for developing the attentional capacities that are fundamental to precision sport performance. The study contributes to the growing body of evidence supporting mind–body interventions in athlete development and provides a foundation for further research examining yoga's effects on competitive archery performance.

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