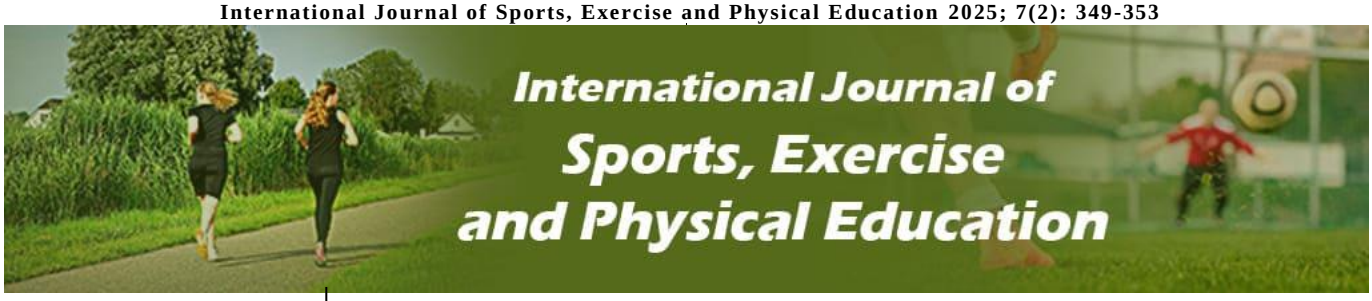

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Effect of psychological intervention on mental imagery of national level archers

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Abstract
The present study examined the effect of a 12 week psychological intervention on imagery ability and performance among national-level Indian archers. Thirty athletes (aged 16-21 years) were randomly assigned to three groups: an imagery group (n = 10), a self-regulation group (n = 10), and an active control group (n = 10). The experimental groups underwent structured psychological skills training three times per week for 50-60 minutes, while the control group continued routine practice. Psychological variables (imagery use), and archery performance scores were assessed pre- and post-intervention. Data were analyzed using ANCOVA with pre-test scores as covariates. Results revealed significant group differences in post-test performance, $F(2, 26) = 17.89$, $p < .001$, partial $\eta^2 = .579$, after adjusting for baseline scores. Both imagery and self-regulation groups showed significant improvements over the control group, with imagery producing the highest mean gains. These findings are consistent with prior research demonstrating the efficacy of imagery and self-regulation in enhancing precision sport performance. The study highlights the importance of incorporating psychological skills training into routine archery practice, suggesting that multi-sensory imagery and self-regulatory strategies can complement physical training to optimize competitive outcomes.

Keywords: Archery, psychological intervention, mental imagery, self-regulation, performance enhancement

Introduction
Target sports like archery rely disproportionately on psychological readiness. Beyond physical strength and refined technique, consistent scoring under pressure depends on attentional control, confidence, arousal regulation, and the ability to execute learned routines despite environmental distractions. Prior accounts in the archery literature estimate that mental factors can dominate performance in such precision sports, often outweighing purely physical determinants; hence, preparing archers psychologically is not optional but foundational to elite outcomes.

Mental imagery in archery
Mental imagery-also called visualization or mental rehearsal-has emerged as a primary intervention to enhance performance in archery. Elite programs (e.g., South Korea, Italy) have long integrated structured imagery alongside physical practice to cultivate competition-specific confidence, stabilize arousal, and insulate shot routines from audience or context effects. Reports highlight systematic use of imagery as part of Olympic preparation and its association with sustained medal success, underscoring its practical value at the highest levels.

At the individual level, imagery is used to pre-experience competition demands (e.g., noise, timing, sight picture) and to rehearse task-relevant cues (stance, hook, anchor, aim, release, follow-through). It also serves as a countermeasure to "target panic" and other pressure-linked breakdowns by re-anchoring attention to controllable elements of the shot process rather than to spectators or external stressors.

Despite these advantages, gaps remain in the systematic application of psychological training within Indian archery. Notable competition cases have illustrated how insufficient emotional control can erode otherwise strong technical ability, motivating context-specific interventions that directly target anxiety regulation and competition focus.

Self-regulation as a theoretical rationale

The present work is grounded in a self-regulation framework that conceptualizes expert performance as cycles of forethought (goal setting, strategic planning), performance (strategy use, self-instruction, imagery, and self-monitoring), and self-reflection (self-evaluation and adaptive inferences). This perspective clarifies *how* and *why* imagery should be embedded: it is a performance-phase strategy that links planned goals to in-moment execution and later informs reflective adjustments.

Purpose of the Study

The present study assesses the effect of a 12-week psychological skills intervention focused on mental imagery and self-regulation on the Sports Imagery ability of national level Indian archers. It was hypothesized that participants receiving the intervention would demonstrate significant impact on the sports imagery levels of archers.

Methodology

Research Design

A pre test-post test randomized controlled design was used to examine the effect of a structured psychological skills intervention on Sports Imagery. Thirty (N=30) national level archers were randomly assigned to one of three groups *viz*., imagery intervention, Self-regulation intervention, and Active control. Pre testing was conducted one week prior to the intervention program and post testing immediately after the 12 weeks. This design helped in assessing the group differences in post-test results of imagery while controlling for baseline scores.

Participants

A total of thirty (N = 30) male and female archers aged 16-21 years were selected from the National Centres of Excellence (NCOE) of the Sports Authority of India and the Lakshmibai National Institute of Physical Education (LNIPE), North-East Regional Centre, Guwahati. All participants selected had minimum of three years of competitive experience. Written informed consent was obtained from all participants prior to data collection. The total participants were randomly further divided into the Imagery group (n = 10), the Self-regulation group (n = 10), or the Control group (n = 10).

Intervention Procedures

The intervention given to the experimental groups (Imagery Group and Self Regulation Group) was of 12 weeks, thrice a week with each session lasting for 50-60 minutes. The active control group was however not part of interventions but continued with regular daily schedule and activities.

Variables and Measures

The variable selected for the study was sport imagery and was measured by standardised questionnaire. The Sports Imagery Questionnaire (SIQ) is a self-report questionnaire, consisting of 30 items. Each item correlates to one of the five functions of imagery - Cognitive Specific, Cognitive General, Motivation Specific, Motivation General-Arousal and Motivation General-Mastery. The SIQ uses a 7-point Likert measurement scale to evaluate test item responses. Each question is responded to on the scale, which records the frequency in which one utilizes the five different types of imagery. (Moritz *et al*, 1996) A rating of '1' corresponds to rarely, whilst a rating of '7' corresponds to often. Within each sub-scale, the responses for individual items are added together and averaged. Out of a possible 7.0, a high score demonstrates a high frequency of use. A low score indicates minimal use of the particular imagery function.

Statistical Analysis

Data were analyzed using descriptive statistics such as Mean and Standard Deviation and Multivariate Analysis of Covariance (MANCOVA) with pre-test scores treated as covariates to adjust for baseline differences among groups. The level of significance was set at $p< 0.05$.

Results and Discussion

Table 1: Descriptive Statistics of the Subfactors of Sports Imagery of Treatment Groups

	Treatment Groups	Mean	Std. Deviation	N
Post test_Cognitive Specific	Exp 1(Imagery)	5.47	0.68	10
	Exp 2 (Self-Regulation)	4.96	0.80	10
	Control	4.71	0.71	10
	Total	5.04	0.78	30
Post test _Cognitive General	Exp 1(Imagery)	5.06	0.68	10
	Exp 2 (Self-Regulation)	5.34	0.42	10
	Control	4.13	0.86	10
	Total	4.84	0.84	30
Post test_Motivation Specific	Exp 1(Imagery)	5.96	0.65	10
	Exp 2 (Self-Regulation)	5.23	1.02	10
	Control	4.90	1.07	10
	Total	5.36	1.01	30
Post test_ Motivation Genaral Arousal	Exp 1(Imagery)	4.52	0.70	10
	Exp 2 (Self-Regulation)	5.02	0.80	10
	Control	4.34	0.82	10
	Total	4.62	0.80	30
Post test_ Motivation General Mastery	Exp 1(Imagery)	5.05	0.99	10
	Exp 2 (Self-Regulation)	5.63	1.04	10
	Control	4.41	0.65	10
	Total	5.03	1.01	30

Table 1 reveals post-test group mean and standard deviation result for three treatment groups-Imagery (Experimental group 1), Self-Regulation (Experimental Group 2), and Control-across five subfactors of sports imagery after

adjusting the pre test scores. The Imagery group achieved in the factor of Cognitive Specific is the highest mean score and SD 5.47±0.68, indicating stronger task-specific cognitive processing after the intervention. The Self-Regulation group followed with a mean and SD of 4.96±0.80, while the Control group scored lowest at 4.71±0.71. The combined mean and SD were 5.04±0.78 reflected the overall effectiveness advantage of the experimental treatments over no intervention.

In the factor of Cognitive General, the Self-Regulation group led with a mean of 5.34±0.42, hinted that self-regulatory strategies generalized more broadly to untrained cognitive tasks. Imagery group participants scored 5.06±0.68, whereas Control remained substantially lower at 4.13±0.86. The Self-Regulation group also showed the lowest variability, implying a consistent benefit across individuals. The total mean of 4.84±0.84 underscored the general lift provided by both experimental conditions.

In the subfactor of Motivation Specific, Motivational gains tied to the specific task were most pronounced in the Imagery group with mean and SD 5.96±0.65, suggested vivid mental rehearsal strongly boosted engagement. Self-Regulation group achieved a moderate mean and SD 5.23±1.02, and Control scored 4.90±1.07. Overall, the combined mean and SD was revealed as 5.36 ±1.01.

The factor of Motivation General Arousal poised for the Self-Regulation group which again outperformed mean and SD 5.02±0.80, indicating participants felt more energized overall. Imagery group followed mean and SD as 4.52±0.70, with Control group at 4.34±0.82. These modest mean differences showed both interventions lifted arousal compared to no training, but to varying extents. The total mean and SD of 4.62±0.80 captured the average participant's arousal level post-test.

The factor of Motivation General Mastery, in the Self-Regulation group yielded the highest sense of mastery revealing mean and SD as 5.63±1.04, reflected confidence in overcoming challenges in unrelated tasks. Imagery group participants reported a mean mastery of 5.05±0.99, while Control laged at 4.41±0.65. The combined mean of 5.03±1.01 highlighted how both cognitive interventions fostered a broader belief in one's abilities beyond the trained domain. The graphical representation mean scores are depicted in Figure 1 a & b.

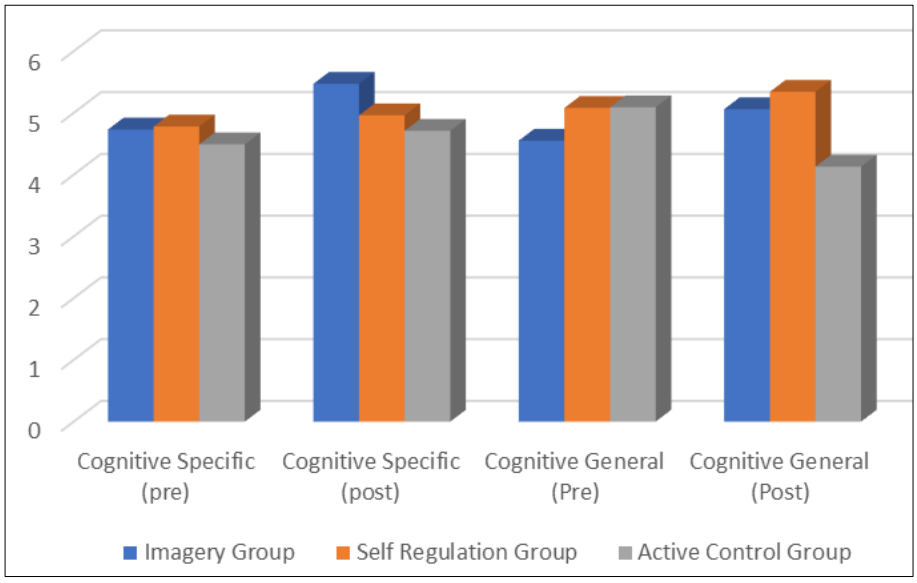

Fig 1(a): Means scores of subfactors of Sports Imagery

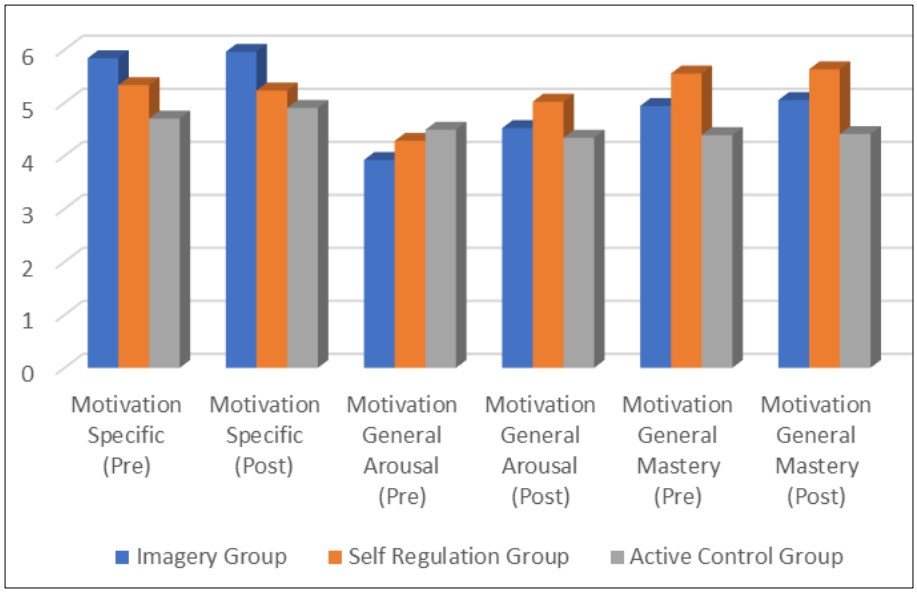

Fig 1(b): Means scores of subfactors of Sports Imagery

Table 2: Mutivariate Analysis on the Variable of Sports Imagery

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	1.192	5.604	10.000	38.000	.000
Wilks' lambda	.159	5.419[a]	10.000	36.000	.000
Hotelling's trace	3.072	5.223	10.000	34.000	.000
Roy's largest root	1.930	7.334[b]	5.000	19.000	.001

In table 2, the MANCOVA analysis revealed significant overall effect of psychological intervention demonstrating that two training groups when compared along with control has a reliable overall effect on the combined set of imagery sub factors. The training impact Wilks' lambda (L = .159, F (10,36) = 5.419, p< .001). This suggested that at least one experimental group differs from the control group across the combined imagery measures. Further univariate analysis was done to determine the specific group differences and variables responsible for the effect.

Table 3: Univariate Analysis on the Variable of Sports Imagery

Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
Post test_Cognitive Specific	Contrast	1.629	2	.815	6.111	.008*
	Error	2.932	22	.133		
Post test _Cognitive General	Contrast	5.470	2	2.735	17.500	.000*
	Error	3.438	22	.156		
Post test_Motivation Specific	Contrast	.283	2	.142	1.173	.328
	Error	2.658	22	.121		
Post test_ Motivation General Arousal	Contrast	1.132	2	.566	2.558	.100
	Error	4.869	22	.221		
Post test_ Motivation General Mastery	Contrast	.465	2	.232	2.537	.102
	Error	2.015	22	.092		
The F tests the effect of Treatment Groups. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.						

This table 3 reveals post-test F tests results examining how treatment groups differ on each imagery dimension by using linearly independent contrasts among estimated marginal means. In the subfactor of Cognitive Specific was .008 there was significant difference seen which revealed that effect showed that the pattern of pairwise comparisons among the three groups differs for cognitive specific. Estimated partial η^2 = 1.629 / (1.629 + 2.932) ≈ .357, indicated a large effect of training on this dimension. Cognitive General was .000 meaning there was significant difference observed. Highly significant results pointed to robust group differences in this factor. Partial η^2 = 5.470 / (5.470 + 3.438) ≈ .614, reflecting a very large training effect. This suggested both psychological training protocols substantially enhanced participants' overall cognitive imagery ability compared to control group.

In the subfactors of Motivation Specific was .328, Motivation General Arousal was .100 and Motivation General Mastery was .102 thus, no difference was seen. No significant group differences emerged for motivation specific imagery Partial η^2 = .283 / (.283 + 2.658) ≈ .096, a small effect size. This indicated that neither training protocol meaningfully changed how participants envisioned motivationally focused details. In the factor of motivation general arousal, a non-significant trend suggested a potential but inconclusive effect on general arousal imagery. Partial η^2 = 1.132 / (1.132 + 4.869) ≈ .188, indicated a medium-sized effect that failed to reach conventional significance. In the factor of motivation general mastery, a non-significant trend for mastery-oriented imagery was seen, Partial η^2 = .465 / (.465 + 2.015) ≈ .187, mirroring the arousal effect size. Thus, significant improvements occurred only in cognitive imagery dimensions whereas motivational aspects (specific, arousal, mastery) did not show reliable gains under current protocols.

Discussion

The findings of the present study demonstrated that a 12-week psychological intervention significantly enhanced sports imagery among national-level athletes, with both imagery and self-regulation groups outperforming the control group. These results align with the central proposition in sports psychology that imagery in precision sports is largely determined by psychological rather than only physical factors. Earlier research has highlighted that between 70-80% of performance in target sports such as archery can be attributed to psychological readiness, including attentional control, confidence, and emotional regulation (Theresa, 2016) [9]. The present findings reinforce this claim, showing that targeted interventions addressing these factors translate into meaningful performance gains.

Comparison with earlier studies

The improvement observed in the imagery group is consistent with studies by Hasmar and Riyadi (2019) [3] and Jaafa and Kassim (2016) [4], who reported significant performance gains and reductions in competitive anxiety following structured imagery training in archers. Similarly, Dhillon *et al*. (2016) [2] found that psychological skills training improved both confidence and shooting outcomes in elite archers. The present results also echo findings by Radhakrishnan (2008) [7], who showed that imagery interventions enhanced both psychological variables and performance in volleyball players, and by Marshall and Gibson (2017) [5], who linked imagery to improvements in confidence among gymnasts. Taken together, the body of evidence indicated that psychological intervention serves as a reliable and effective tool for psychological factors enhancement across multiple sports.

Why imagery training worked

Imagery training likely produced the strongest gains because of its direct link to the technical and psychological demands of archery. Mental rehearsal through imagery allows athletes to simulate the act of shooting in a multi-sensory manner, engaging visual, kinesthetics, and emotional systems in ways similar to actual execution. This process improves motor encoding, reinforces attentional focus during the aiming and release phases, and reduces the likelihood of intrusive thoughts during competition. Moreover, imagery fosters confidence by allowing athletes to repeatedly visualize successful performances, which in turn mitigates competitive anxiety. Such mechanisms explain why the imagery group not only achieved the highest post-test scores but also displayed a large effect size relative to the control condition.

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