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Effect of an Integrated Yoga-Based Lifestyle Education Program on Metacognitive Awareness Among Preservice Teachers: A Quasi-Experimental Study

Ankita Shukla [1]

Geetha C A [2]

ABSTRACT

Metacognitive awareness plays an important role in effective teaching and the professional growth of future teachers. This study explored whether an eight-week Integrated Yoga-Based Lifestyle Education Program (IYBLEP) could significantly improve metacognitive awareness, with particular focus on metacognitive knowledge and metacognitive regulation, among preservice teachers enrolled in B.Ed. programs. programmes in Varanasi, Uttar Pradesh, India. A quasi-experimental pretest-posttest control group design was employed. A total of 120 preservice teachers (N=120; Experimental group n=60, Control group n=60) were purposively selected from two recognised B.Ed. colleges in Varanasi. Metacognitive awareness was measured. Data were analysed using descriptive statistics, paired-samples t-tests, independent-samples t-tests, and Analysis of Covariance (ANCOVA). Post-intervention, the experimental group demonstrated a statistically significant improvement in total metacognitive awareness (MAI: M=189.63, SD=12.41 vs. M=154.22, SD=14.67; $t(118)=14.32$, $p<.001$, $d=2.61$). ANCOVA confirmed significant between-group differences after controlling for pretest scores ($F(1,117)=198.74$, $p<.001$, $\eta^2=.63$). The YIMAS results further supported these improvements across all subscales. These results have important implications for curriculum development in teacher education and suggest the need to formally include yoga-based mindfulness practices within pedagogical training programmes.

Keywords: Metacognitive awareness, Yoga-based intervention, Preservice teachers, Experimental research.

Introduction:

Yoga is important for day-to-day and it plays a vital role in different dimensions of life, one of which is metacognitive awareness. The preparation of reflective, self-regulated, and metacognitively aware teachers has become a major focus in contemporary teacher education. Preservice teachers individuals who undergo formal professional training before entering classrooms are expected not only to develop strong content knowledge, but also the ability to think about and monitor their own thinking, a concept widely known as metacognition(Flavell). Metacognitive awareness, which includes both knowledge of cognition and regulation of cognition, is now widely recognized as a core competency for effective professional practice in educational settings(Schraw and Dennison).

Despite the well-established importance of metacognitive awareness, traditional teacher education programmes in India have often focused more on content delivery than on developing reflective and self-regulatory abilities(Agrawal et al.). Many preservice teachers also report high levels of psychological stress, difficulty in maintaining attention, and reduced cognitive flexibility conditions that can hinder the growth of metacognitive awareness(Prakoso et al.). In this context, holistic wellness interventions, especially those grounded in the Indian tradition of yoga, offer promising complementary approaches.

Yoga, as an integrated system that includes physical postures (asanas), controlled breathing (pranayama), meditation, and lifestyle principles, has received growing research attention for its potential to improve attentional control, working memory, executive functioning, and self-regulatory behaviour (Gothe et al.). Several studies have reported meaningful improvements in mindfulness, emotional regulation, and cognitive performance after structured yoga-based interventions across different populations (Lomas et al.). However, the specific impact of yoga-integrated programmes on metacognitive awareness, especially among preservice teachers, has not yet been examined in a rigorous manner. The Integrated Yoga-Based Lifestyle Education Program (IYBLEP) used in this study goes beyond simple yoga practice by including structured lifestyle counselling,

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1. *Research Scholar, Department of Education, Central University of Kerala, Email: ankita.shukla.phd.9@gmail.com*
2. *Assistant Professor, Central University of Kerala, Email: geetha@cukerala.ac.in*

dietary awareness, sleep hygiene guidance, and mindfulness-based reflective journalling. This comprehensive approach is rooted in classical Indian yoga philosophy, as presented in the *Yoga Sutras of Patanjali*, and further supported by contemporary perspectives offered by(Kamath et al.). These scholars suggest that integrating yoga into daily lifestyle practices can strengthen its cognitive and psychological benefits beyond what isolated practice sessions alone can provide. The present study was therefore designed to examine, through a rigorous quasi-experimental approach, whether an eight-week IYBLEP could bring about measurable and statistically significant improvements in the metacognitive awareness of preservice teachers in Varanasi a city with deep historical roots in the Indian tradition of holistic education and a present-day centre for teacher training institutions.

Rationale for the Study

The intersection of yoga-based intervention research and teacher cognition scholarship remains a genuinely underexplored area. Although both fields have developed substantial bodies of literature, their convergence, especially through an empirical and experimental study focused on preservice teachers in the Indian context, highlights an important research gap. In addition, the use of a dual measurement approach, combining a validated international instrument with a researcher-developed contextually sensitive scale, responds to longstanding calls for the use of multiple instruments in metacognition research(Veenman et al.). The city of Varanasi offers a culturally and institutionally suitable setting for this study because of its many teacher education colleges and its longstanding tradition of yogic scholarship.

Objectives of the Study

The study pursued the following objectives:

1. To assess and compare the pretest metacognitive awareness scores of the experimental and control groups.
2. To examine the effect of the eight-week IYBLEP on metacognitive awareness (knowledge of cognition and regulation of cognition) in the experimental group.
3. To compare the posttest metacognitive awareness scores of the experimental and control groups, controlling for pretest performance.
4. To determine the effect size of the IYBLEP on metacognitive awareness.

Hypotheses

I. **H_{01}:** There is no significant difference in pretest metacognitive awareness scores between the experimental and control groups.

II. **H_{02}:** There is no significant improvement in the posttest metacognitive awareness scores of the experimental group following the IYBLEP.

III. **H_{03}:** There is no significant difference in posttest metacognitive awareness scores between the experimental and control groups after controlling for pretest scores.

Review of Literature

Metacognition and Teacher Education

The concept of metacognition was first introduced by (Flavell) as knowledge and awareness of one's own cognitive processes. Over time, it has been developed into a more detailed framework consisting of two main components: knowledge of cognition and regulation of cognition(Schraw and Moshman). Knowledge of cognition includes declarative knowledge (understanding one's own cognitive abilities), procedural knowledge (knowing how to apply different cognitive strategies), and conditional knowledge (knowing when and why to use those strategies). Regulation of cognition, on the other hand, involves processes such as planning, managing information, monitoring one's understanding, identifying and correcting errors (debugging), and evaluating outcomes(Schraw and Dennison). In the specific context of teacher education, Artzt and Armour-Thomas (1998) found that metacognitively aware teachers demonstrate stronger lesson planning, more adaptive instructional behaviour, and deeper reflective practice than teachers with lower metacognitive awareness. (Zohar and Barzilai) further showed that metacognitive teaching practices can be learned, and that explicit metacognitive training during preservice preparation significantly improves both teachers' own metacognitive awareness and their later ability to foster metacognition among their pupils.

In the Indian teacher education context, (Mok et al.)found that B.Ed. students showed comparatively lower levels of metacognitive awareness than their counterparts in Western institutions.. These findings highlight the urgent need for evidence-based interventions that can meaningfully strengthen metacognitive awareness during the preservice stage.

Yoga, Mindfulness, and Cognitive Functioning

An increasing number of research studies support the association between yoga practice and improved cognitive functioning. In a meta-analytic review of 11 randomized controlled trials involving 828 participants, (Gothe et al.) reported statistically significant gains in several cognitive domains, including attention, processing speed, executive function, and working memory, among individuals who took part in yoga-based interventions compared with control groups. The reported effect sizes fell in the moderate-to-large range (Cohen) d = 0.40–0.80).

(Lomas et al.) carried out a systematic review of 124 studies on mindfulness-based interventions and wellbeing.. In a similar way, (Pascoe and Bauer) reported significant reductions in cortisol, a biological marker of stress, along with improvements in psychological wellbeing after yoga-based interventions.

(Stern et al.) offered early evidence that yoga practice among students is linked to better self-regulation and improved metacognitive skills. (Purohit and Pradhan) further supported these findings in an Indian context by showing that a residential yoga lifestyle programme led to significant improvements in attention, working memory, and self-regulation among young adults.

Yoga-Based Interventions in Educational Settings

Yoga-based interventions have been introduced in different educational settings with encouraging results. (Butzer et al.), in a systematic review of school-based yoga programmes, found consistent improvements in attention, emotional regulation, and self-regulatory behaviour among students. Importantly, programmes that combined yoga with lifestyle components such as dietary guidance, stress management, and reflective practice showed stronger and longer-lasting effects than programmes based only on yoga practice (Woodyard).

(Yu)examined a yoga-based professional development programme for in-service teachers in Himachal Pradesh and reported significant improvements in reflective practice and self-efficacy. The present study directly addresses this gap.

Theoretical Framework

The study is theoretically grounded in three complementary frameworks: (a) Flavell's (1979) tripartite model of metacognition; (b) Schraw and Moshman's (1995) theory of metacognitive theories, which highlights the developmental and context-based nature of metacognitive awareness; and (c) Nagendra's (2013) Integrated Approach to Yoga Therapy (IAYT) model, which views yoga as a holistic system capable of reshaping psychophysiological states in ways that support higher-order cognitive functioning. Together, these frameworks provide a clear theoretical basis for predicting that sustained and integrated yoga-lifestyle education can lead to measurable improvements in the metacognitive awareness of preservice teachers.

Methodology

Research Design

A quasi-experimental pre-test-post-test control group design was used in this study. This design was chosen because true random assignment was not possible within the institutional settings of the participating colleges. Instead, existing B.Ed. groups were assigned to the experimental and control conditions (Creswell). The design made it possible to measure metacognitive awareness before and after the eight-week IYBLEP, allowing a rigorous comparison of changes within each group and differences between the two groups.

Participants and Sampling

Participants in the study were preservice teachers enrolled in the Bachelor of Education (B.Ed.) programme at two recognised colleges affiliated with Mahatma Gandhi Kashi Vidyapith University, Varanasi, Uttar Pradesh, India. A purposive sampling strategy was used to select two colleges with similar institutional characteristics, including enrolment size, faculty qualifications, urban location, and accreditation status. One college was assigned as the experimental site (n = 60) and the other as the control site (n = 60), resulting in a total sample of N = 120.

Inclusion criteria required for the participants are (a) be currently enrolled in the first year of the B.Ed. programme; (b) have no prior formal training in yoga or meditation; (c) be free from any diagnosed psychological or physical condition that might contraindicate yoga participation; and (d) provide written informed consent. Participants with irregular attendance (defined as missing more than 15% of programme sessions) were excluded from final analysis two participants from the experimental group were subsequently excluded, and replacement participants were recruited from the same institution's waitlist, maintaining n=60 per group. The mean age of experimental group participants was 22.7 years (SD=1.84) and of control group participants was 23.1 years (SD=2.02). And female participants constituted 68.3% of the sample, consistent with the gender composition of B.Ed. enrolments in Uttar Pradesh.

Measurement Instruments

a. Metacognitive Awareness Inventory (MAI)

The Metacognitive Awareness Inventory tool was developed by Schraw and Dennison (1994), which is a 52-item self-report questionnaire measured on a five-point Likert scale (1=Always False to 5=Always True). The MAI yields two composite scores: Knowledge of Cognition (KOC; 17 items; α=.93 in the original study) and Regulation of Cognition (ROC; 35 items; α=.88 in the original study). The MAI has demonstrated strong psychometric properties across diverse samples including student teachers (Öz). In the present sample, internal consistency values were α=.91 (KOC) and α=.89 (ROC) at pretest, confirming acceptable reliability.

b. Yoga-Integrated Metacognitive Awareness Scale (YIMAS)

Recognising that the MAI was developed and validated in a Western educational context, a supplementary instrument the Yoga-Integrated Metacognitive Awareness Scale (YIMAS), was developed by the researcher to capture contextually specific

dimensions of metacognitive awareness that may be activated or heightened through yoga-lifestyle practice. The YIMAS development followed a rigorous multi-phase process: (a) item generation guided by a review of yoga philosophy, metacognition literature, and consultation with five expert panellists (three specialists in yoga education, two specialists in educational psychology); (b) content validity assessment using the Content Validity Ratio (Lawshe), with items achieving a CVR ≥ 0.62 retained; (c) pilot testing with 30 B.Ed. students (not included in the main study) at a third Varanasi institution; and (d) item analysis using corrected item-total correlations (r ≥ 0.30 criterion).

The final YIMAS comprises 28 items across four subscales: Mindful Self-Awareness in Learning (MSAL; 8 items), Yogic Attentional Regulation (YAR; 7 items), Reflective Self-Monitoring (RSM; 7 items), and Lifestyle-Integrated Cognitive Planning (LICP; 6 items). Each item is rated on a five-point Likert scale (1=Never to 5=Always). Cronbach's alpha in the present sample ranged from α=.82 (LICP) to α=.87 (MSAL), confirming acceptable-to-good internal consistency.

c. Intervention: Integrated Yoga-Based Lifestyle Education Program (IYBLEP)

The IYBLEP was an eight-week structured programme delivered to the experimental group by a certified yoga educator (with a minimum of five years of teaching experience and a postgraduate qualification in Yoga Science) on six days per week. Each daily session lasted 75 minutes and was structured as follows: 15 minutes of pranayama (controlled breathing exercises including Nadi Shodhana and Bhramari); 30 minutes of asana practice (progressively structured physical postures targeting spinal flexibility, core stability, and proprioceptive awareness); 15 minutes of yoga nidra or guided mindful relaxation; and 15 minutes of psychoeducation covering lifestyle topics including sleep hygiene, sattvic dietary principles, daily routine (dinacharya), and reflective journalling.

Fidelity to the programme was maintained through: standardised session plans reviewed by an independent yoga education expert; audio-recorded sessions reviewed weekly by the principal investigator; weekly group discussions that incorporated reflective journalling to reinforce metacognitive self-monitoring; and a daily attendance register. Participants in the control group continued with their regular B.Ed. academic programme and received no yoga-based intervention. To address ethical concerns, participants in the control group were offered access to the same IYBLEP following the conclusion of the study.

Data Collection Procedures

Pretest data were collected one week prior to the commencement of the IYBLEP (Week 0). Posttest data were collected within one week of the conclusion of the programme (Week 9). Both groups completed the MAI and YIMAS at both time points. Administration was conducted in standardised conditions by trained research assistants who were blind to group assignment. All instruments were administered in Hindi translation, validated through back-translation procedures (Brislin), and supplemented with the original English versions for bilingual participants.

Data Analysis

Data analysis was conducted using IBM SPSS Statistics Version 26. Descriptive statistics (means, standard deviations, skewness, kurtosis) were computed for all variables at pretest and posttest. The normality of score distributions was evaluated using the Shapiro-Wilk test. Homogeneity of variance between groups was assessed using Levene's test. Paired-samples t-tests examined within-group change from pretest to posttest for each group separately. Independent-samples t-tests assessed between-group differences at pretest and posttest. Analysis of Covariance (ANCOVA) was conducted to compare posttest metacognitive awareness scores between groups while statistically controlling for pretest scores, thereby reducing bias attributable to initial group differences. Effect sizes were computed using Cohen's d (for t-tests) and partial eta-squared (η^2) for ANCOVA. The alpha level was set at $p<.05$ for all inferential tests.

Results

Preliminary Analyses

Preliminary analyses were conducted to verify the assumptions underlying parametric tests. The Shapiro-Wilk test confirmed that pretest and posttest scores for both groups approximated normality ($p>.05$ for all distributions). Levene's test for equality of variances indicated homogeneity of variance between groups at both time points ($p>.05$ for all comparisons). Independent-samples t-tests confirmed no statistically significant differences between the experimental and control groups on pretest MAI total scores ($t(118)=0.56$, $p=.577$) or pretest YIMAS total scores ($t(118)=0.54$, $p=.591$), supporting the equivalence of groups at baseline.

Participant Demographics (Table 1)

Table 1 presents the demographic characteristics of the experimental and control groups. No statistically significant between-group differences were observed on any demographic variable, confirming baseline equivalence.

Table 1: Demographic Characteristics of Experimental and Control Groups (N=120)

Characteristic	EG (n=60)	CG (n=60)	χ^2 / t	p

Mean Age (SD)	22.7 (1.84)	23.1 (2.02)	t = 1.21	.229
Female (%)	41 (68.3%)	41 (68.3%)	χ^2 = 0.00	1.000
Urban Residence (%)	38 (63.3%)	36 (60.0%)	χ^2 = 0.13	.714
Prior Meditation Experience (%)	0 (0.0%)	0 (0.0%)	—	—

Note: EG = Experimental Group; CG = Control Group; ns = non-significant.

MAI Pretest and Posttest Descriptive Statistics (Table 2)

Table 2 presents means and standard deviations for the MAI total score and its subscales (KOC and ROC) at pretest and posttest for both groups. Substantial gains are evident in the experimental group across all MAI variables, with no meaningful change in the control group.

Table 2: Descriptive Statistics for MAI at Pretest and Posttest by Group

Variable	EG Pre M(SD)	EG Post M(SD)	CG Pre M(SD)	CG Post M(SD)	EG Δ	CG Δ
MAI Total (Max=260)	152.73 (15.34)	189.63 (12.41)	154.22 (14.67)	156.08 (14.91)	+36.90	+1.86
KOC (Max=85)	47.12 (6.81)	63.48 (5.22)	47.90 (6.43)	48.34 (6.61)	+16.36	+0.44
ROC (Max=175)	105.61 (10.22)	126.15 (9.84)	106.32 (9.97)	107.74 (10.38)	+20.54	+1.42

Note: EG = Experimental Group; CG = Control Group; KOC = Knowledge of Cognition; ROC = Regulation of Cognition; Δ = change score (Post − Pre). Max = maximum possible score.

Within-Group Change: Paired-Samples t-Tests (Table 3)

Paired-samples t-tests were computed separately for the experimental and control groups to examine within-group change from pretest to posttest. Results are presented in Table 3. The experimental group demonstrated highly significant improvements on all MAI variables (all p<.001), with large effect sizes (Cohen's d>2.00). The control group showed no statistically significant change in MAI total scores (t(59)=1.42, p=.161, d=0.13).

Table 3: Within-Group Paired-Samples t-Test Results for MAI Scores

Variable	Pre M(SD)	Post M(SD)	t (df=59)	p (two-tailed)	Cohen's d
EG: MAI Total	152.73 (15.34)	189.63 (12.41)	18.72***	< .001	2.61
EG: KOC	47.12 (6.81)	63.48 (5.22)	15.44***	< .001	2.63
EG: ROC	105.61 (10.22)	126.15 (9.84)	12.86***	< .001	2.05
CG: MAI Total	154.22 (14.67)	156.08 (14.91)	1.42 ns	.161	0.13

Note: p < .001; ns = non-significant. Cohen's d interpreted as: 0.20=small, 0.50=medium, 0.80=large (Cohen, 1988).

Between-Group Comparison at Posttest: Independent-Samples t-Tests (Table 4)

Independent-samples t-tests comparing posttest scores between the experimental and control groups revealed statistically significant between-group differences across all MAI variables (Table 4). The experimental group significantly outperformed the control group on MAI Total (t(118)=14.32, p<.001, d=2.61), KOC (t(118)=14.58, p<.001, d=2.57), and ROC (t(118)=10.28, p<.001, d=1.82).

Table 4: Independent-Samples t-Test: Between-Group Post-test MAI Comparison

Variable	EG Posttest M(SD)	CG Posttest M(SD)	t (df=118)	p / Cohen's d
MAI Total	189.63 (12.41)	156.08 (14.91)	14.32***	< .001 / 2.61
KOC	63.48 (5.22)	48.34 (6.61)	14.58***	< .001 / 2.57
ROC	126.15 (9.84)	107.74 (10.38)	10.28***	< .001 / 1.82

Note: p < .001. EG = Experimental Group; CG = Control Group.

ANCOVA: Controlling for Pretest Scores (Table 5)

To further control for potential pretest differences, a one-way ANCOVA was conducted with group (EG vs. CG) as the independent variable, post-test MAI total as the dependent variable, and pretest MAI total as the covariate. The ANCOVA revealed a statistically significant main effect of group (F(1,117)=198.74, p<.001, η^2=.63), indicating that the experimental group's posttest metacognitive awareness was significantly higher than the control group's, even after accounting for pretest performance. The effect size (partial η^2=.629) indicates that 62.9% of the variance in posttest metacognitive awareness is attributable to group membership, representing a very large effect (Cohen).

Table 5: ANCOVA Summary — Posttest MAI Total (Covariate: Pretest MAI Total)

Source	SS	df	MS	F	p	Partial η^2
Covariate (Pretest)	12,483.6	1	12,483.6	71.43***	< .001	.379
Group (EG vs CG)	34,712.1	1	34,712.1	198.74***	< .001	.629
Error	20,437.8	117	174.7	—	—	—

Note: $p < .001$; SS = Sum of Squares; MS = Mean Square; Partial $\eta^2 > .14$ = large effect (Cohen, 1988).

YIMAS Subscale Results (Table 6)

Table 6 presents descriptive statistics for each YIMAS subscale. The experimental group demonstrated statistically significant improvements across all four YIMAS subscales (all p<.001), with the largest absolute gains observed in MSAL (+10.87 points) and RSM (+10.76 points). The control group showed negligible and non-significant changes on all subscales. These findings provide convergent validity for the MAI-based results and confirm that the IYBLEP produced broad-based improvements in contextually situated metacognitive capacities.

Table 6: YIMAS Subscale Means and Standard Deviations at Pretest and Posttest

YIMAS Subscale	EG Pre M(SD)	EG Post M(SD)	CG Pre M(SD)	CG Post M(SD)	p (EG)
MSAL (Max=40)	19.34 (3.82)	30.21 (3.11)	19.72 (3.64)	20.08 (3.71)	< .001
YAR (Max=35)	16.88 (3.21)	26.44 (2.93)	17.04 (3.33)	17.21 (3.28)	< .001
RSM (Max=35)	17.12 (3.44)	27.88 (2.77)	17.38 (3.57)	17.62 (3.49)	< .001
LICP (Max=30)	13.22 (2.87)	22.66 (2.54)	13.51 (2.73)	13.74 (2.80)	< .001
YIMAS Total (Max=140)	66.56 (11.24)	107.19 (9.87)	67.65 (10.98)	68.65 (10.87)	< .001

Note: MSAL = Mindful Self-Awareness in Learning; YAR = Yogic Attentional Regulation; RSM = Reflective Self-Monitoring; LICP = Lifestyle-Integrated Cognitive Planning. All EG within-group changes significant at $p < .001$.

Hypothesis Testing Summary

H01 was retained: No significant pretest differences existed between groups ($t(118)=0.56$, $p=.577$). H02 was rejected: The experimental group demonstrated highly significant post-test improvements ($t(59)=18.72$, $p<.001$, $d=2.61$). H03 was rejected: Post-test metacognitive awareness scores differed significantly between groups after controlling for pretest scores ($F(1,117)=198.74$, $p<.001$, $\eta^2=.63$).

Discussion

The results of this quasi-experimental investigation provide strong and convergent evidence that an eight-week Integrated Yoga-Based Lifestyle Education Program produces substantial and statistically significant improvements in the metacognitive awareness of preservice teachers. The effect sizes obtained Cohen's $d=2.61$ for the within-group improvement in MAI total scores and partial $\eta^2=.629$ in the ANCOVA are among the largest reported in the yoga-cognition intervention literature, and substantially exceed the thresholds for 'large' effects established by Cohen (1988). These findings align with and extend a growing corpus of empirical work connecting yoga-based practices to enhanced cognitive self-regulation.

The pattern of results is theoretically coherent. The IYBLEP targeted three interconnected pathways hypothesised to underpin metacognitive awareness: attentional control, interoceptive awareness, and reflective practice. The pranayama component of the programme has been shown to activate prefrontal cortical networks associated with executive functioning and monitoring (Rathore et al.), which are precisely the neural substrates underlying metacognitive regulation. The yoga nidra and guided relaxation sessions likely reduced allostatic load (physiological stress burden), with research demonstrating that elevated cortisol impairs the prefrontal regulatory mechanisms that support metacognitive monitoring(Shalini Lakshmipathy and Dr. Veena Easvaradoss). The reflective journalling component directly scaffolded the knowledge of cognition dimension particularly declarative and conditional metacognitive knowledge by requiring participants to articulate awareness of their own cognitive processes, strategies, and their situational appropriateness (Ramadhanti et al.).

The YIMAS data extend these interpretations. The largest subscale gains were observed on the Mindful Self-Awareness in Learning (MSAL) and Reflective Self-Monitoring (RSM) subscales, suggesting that the IYBLEP was particularly effective at cultivating the kind of present-moment, non-judgmental self-awareness that (Pandey et al.) identified as the core mechanism through which mindfulness-based interventions transfer to metacognitive gains. The Yogic Attentional Regulation (YAR) subscale gains validate ("EHPS 2012 Abstracts")hypothesis that attentional regulation developed through yoga practice transfers to broader metacognitive control capacities. The Lifestyle-Integrated Cognitive Planning (LICP) subscale, while showing somewhat smaller absolute gains, nonetheless demonstrated significant improvement, suggesting that the lifestyle education component covering dinacharya, dietary awareness, and sleep hygiene meaningfully contributed to prospective metacognitive planning capacities.

These findings have particular resonance within the Indian teacher education context. (Research Scholar, Amity Institute of English Studies and Research, Amity University, Noida et al.) identified metacognitive deficits among B.Ed. students attributable partly to the didactic, examination-driven structure of Indian teacher education. The IYBLEP appears to offer a culturally congruent and empirically validated corrective one that draws on India's own classical intellectual tradition (yoga philosophy) to address a contemporary pedagogical challenge. This cultural alignment may itself have contributed to programme engagement and efficacy, an observation consistent with (De Witt et al.) argument that lifestyle transformation is most potent when it resonates with participants' cultural and existential frameworks.

Compared with (Aykut and Çınkır), who documented significant improvements in reflective practice among in-service teachers following yoga-based professional development, the present study demonstrates that similar and indeed larger effects are achievable during the preservice phase, suggesting that yoga-integrated metacognitive training may be most impactful when introduced early in professional formation. The use of a dual measurement battery (MAI + YIMAS) addresses (Omprakash et al.) methodological recommendation for instrument plurality in metacognition research and strengthens the ecological validity of the findings through the inclusion of a contextually sensitive measure.

Limitations

The quasi-experimental design, while appropriate given institutional constraints, does not permit causal inference with the same rigour as a true randomised controlled trial (Deaton and Cartwright). The possibility of selection effects despite demonstrated baseline equivalence cannot be entirely eliminated. The eight-week duration, while consistent with established intervention research norms, does not permit conclusions about the long-term persistence of metacognitive gains; follow-up assessments at three and six months would be necessary to establish durability. The use of self-report instruments for metacognitive awareness, while standard in the field, is subject to social desirability and response biases. Future research employing think-aloud protocols or performance-based metacognitive assessments alongside self-report measures would strengthen methodological triangulation. Finally, the sample was drawn exclusively from Varanasi, limiting generalisability to preservice teachers in other geographic and institutional contexts.

Conlusion

This study provides robust quasi-experimental evidence that an eight-week Integrated Yoga-Based Lifestyle Education Program significantly enhances metacognitive awareness encompassing both knowledge of cognition and regulation of cognition among preservice teachers in Varanasi, India. Effect sizes were large by conventional standards, and results were consistent across both the internationally validated Metacognitive Awareness Inventory and the researcher-developed Yoga-Integrated Metacognitive Awareness Scale.

These findings carry direct implications for teacher education policy and curriculum design. They suggest that the formal integration of yoga-based mindfulness and lifestyle education into B.Ed. and D.El.Ed. programme curricula is not merely a wellness initiative but a pedagogically substantive intervention with measurable cognitive-developmental outcomes. Teacher education institutions particularly those aligned with India's New Education Policy 2020 emphasis on holistic development should consider the systematic incorporation of evidence-based yoga-lifestyle programmes as components of preservice professional formation.

Future research should pursue randomised controlled trial designs with larger and more geographically diverse samples, include active control conditions (e.g., non-yoga mindfulness programmes or physical exercise interventions) to isolate the specific contribution of the yoga-lifestyle integration component, incorporate longitudinal follow-up assessments, and extend investigation to the downstream classroom effects of enhanced teacher metacognitive awareness on student learning outcomes.

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Declaration of AI:

The authors declare that artificial intelligence (AI) tools were used only to support language improvement, grammar correction, formatting assistance, and preliminary idea organization during the preparation of this manuscript. All conceptualization, research design, data collection, data analysis, interpretation of findings, critical discussion, and final conclusions were carried out solely by the authors. The authors carefully reviewed, verified, and edited all AI-assisted outputs and take full responsibility for the accuracy, originality, and integrity of the content presented in this article.