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## A comparative study on the impact of yoga and physical exercises on mental health of Indian adolescents

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### Abstract

The mental health of adolescents in India has become a significant public health concern amid rising academic pressure, urban stressors, digital exposure, and socio-cultural changes. This research paper presents a comparative study examining the impact of Yoga and Physical Exercises on the mental health of Indian adolescents aged 13 to 19 years. The study aims to explore the differential effects of these two practices on psychological parameters such as stress, anxiety, depression, emotional regulation, and overall well-being.

Using a mixed-method research design, the study involved 300 adolescents from urban and semi-urban schools across three states in India. Participants were divided into two experimental groups one practicing structured Yoga (including asanas, pranayama, and dhyana) and the other engaging in conventional physical exercises (aerobics, running, calisthenics, and sports drills) over a 12-week intervention period. Standardized tools such as the General Health Questionnaire (GHQ-12), Beck Depression Inventory (BDI), and the Perceived Stress Scale (PSS) were administered pre- and post-intervention. Qualitative interviews were also conducted with selected participants and instructors to understand their subjective experiences.

Findings reveal that while both Yoga and Physical Exercises led to significant improvements in mental health, Yoga had a comparatively greater impact on reducing symptoms of anxiety and enhancing emotional balance and mindfulness. Physical exercises, on the other hand, were more effective in improving mood regulation and reducing depressive tendencies, particularly among male adolescents. The study underscores the potential of integrating both Yoga and physical education into school curricula to promote holistic mental health outcomes in Indian adolescents. Furthermore, it highlights the culturally embedded relevance of Yoga as a therapeutic and preventive strategy for adolescent psychological well-being in the Indian context.

**Keywords:** Yoga, physical exercises, mental health, Indian adolescents, stress, anxiety, depression, emotional regulation, school-based interventions, holistic well-being

### 1. Introduction

#### 1.1 Background

Adolescence represents a pivotal stage in human development, characterized by profound emotional, cognitive, physiological, and social transformations. This period, typically ranging from ages 10 to 19, is marked by heightened sensitivity to external pressures and internal conflicts, often triggered by rapid biological changes and the evolving need for identity, autonomy, and social belonging.

In the Indian context, adolescents comprise nearly one-fifth of the country's population, making their well-being a matter of national priority. Despite their demographic significance, the mental health needs of Indian adolescents remain inadequately addressed in mainstream healthcare and policy frameworks. In recent years, mental health issues such as anxiety, chronic stress, depressive symptoms, and mood disturbances have shown a noticeable rise among adolescents, influenced by a multitude of interconnected factors.

Academic competition is intense and unforgiving, often leading to performance pressure, fear of failure, and burnout. Simultaneously, social changes such as urbanization, digital

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immersion, peer comparison, and lifestyle shifts contribute to emotional alienation and decreased resilience. Body image concerns, exacerbated by media portrayal of unrealistic standards, further lead to low self-esteem and psychosocial distress. Additionally, family expectations especially in collectivist cultures like India may impose emotional burdens that many adolescents are ill-equipped to handle. These cumulative stressors significantly impact adolescents' emotional balance and cognitive functioning, calling for targeted interventions.

## 1.2 Need for the study

Addressing adolescent mental health requires holistic, accessible, and culturally relevant strategies. While existing psychological and pharmacological interventions offer symptomatic relief, there is a growing global recognition of the preventive and therapeutic potential of non-pharmacological approaches such as yoga and physical exercise. Numerous studies have demonstrated that both yoga and physical activities can improve mental health by reducing stress hormones, enhancing mood, and improving self-regulation. However, there exists a research gap in comparative studies that critically evaluate the relative effectiveness of these two modalities, particularly within the Indian socio-cultural milieu.

Yoga, rooted in India's ancient philosophical and spiritual traditions, offers a unique mind-body discipline that integrates physical postures (asanas), breath control (pranayama), and meditation (dhyana). Its holistic approach addresses not just the physical but also the emotional and spiritual dimensions of well-being. Despite its global popularity and empirical backing, yoga is often underutilized in formal adolescent health programs in India. On the other hand, conventional physical exercises including aerobics, sports drills, and cardiovascular routines are widely practiced and known to boost physical fitness and mental alertness, but may not sufficiently target emotional regulation or inner awareness.

Given India's historical association with yoga and the urgent need to prioritize adolescent mental health, this study seeks to comparatively examine the impact of yoga and general physical exercises on the psychological well-being of Indian adolescents. It aims to generate empirical insights that can inform school-based interventions, mental health policy, and community wellness programs tailored to the needs and realities of Indian youth.

## 2. Objectives

### 2.1 To assess the current mental health status of Indian adolescents

This objective seeks to undertake a comprehensive evaluation of the prevailing mental health conditions among adolescents in India. Adolescence, a period typically ranging from ages 10 to 19, is marked by significant psychological, emotional, cognitive, and social transitions. In recent years, Indian adolescents have been increasingly vulnerable to mental health issues such as stress, anxiety, depression, and low self-esteem, owing to intense academic pressure, rapidly changing social environments, peer influence, family expectations, and exposure to digital media. This objective aims to systematically collect data through validated psychological scales and surveys to gauge the prevalence and severity of mental health disorders in this demographic. Particular attention will be paid to variations across gender, socioeconomic backgrounds, urban-rural settings, and school types (public vs. private) to obtain a holistic understanding of adolescent mental well-being in the Indian context.

### 2.2 To evaluate the impact of structured yoga interventions on adolescent mental health

Yoga, rooted in ancient Indian philosophy, is increasingly recognized for its therapeutic benefits on mental health, particularly among youth. This objective focuses on designing and implementing structured yoga programs including asanas (physical postures), pranayama (breathing techniques), and dhyana (meditation practices) and measuring their effects on various psychological variables. By integrating these yoga modules into the daily routine of adolescents over a defined period (e.g., 8-12 weeks), the study aims to observe changes in emotional regulation, anxiety levels, mood stability, and overall mental resilience. The intervention will be assessed using pre- and post-evaluation tools to determine its effectiveness in fostering emotional balance and psychological well-being.

### 2.3 To examine the influence of general physical exercises on adolescent mental health

Physical activity is widely known to trigger neurochemical processes that enhance mental wellness, such as the release of endorphins and reduction in cortisol levels. This objective involves exploring the psychological effects of regular, non-yogic physical exercises such as aerobic workouts, strength training, jogging, and sports-based physical activities on adolescent mental health. The focus will be on evaluating the potential of these exercises to alleviate symptoms of depression, reduce anxiety, increase self-esteem, and improve cognitive functioning. The study will also compare engagement levels, motivation, and adherence patterns to physical activity among adolescents, aiming to assess its practical applicability within school or community settings.

### 2.4 To compare the effectiveness of yoga and physical exercises on stress, anxiety, depression, emotional regulation, and self-esteem

While both yoga and physical exercise are known to offer mental health benefits, their relative effectiveness, especially in the context of Indian adolescents, remains underexplored. This objective aims to conduct a comparative analysis to identify which intervention yoga or general physical exercise yields more significant improvements across key psychological domains. These include stress reduction, anxiety management, depressive symptom alleviation, emotional self-regulation, and enhancement of self-esteem. The study will employ rigorous experimental or quasi-experimental designs with control groups, standardized assessment tools, and statistical analyses to determine the comparative efficacy of the two approaches. This will help identify the more impactful strategy for promoting adolescent mental health in schools and community-based programs.

### 2.5 To offer recommendations for educational and policy frameworks to promote adolescent mental health

Building upon the empirical findings of the study, this objective aims to formulate actionable recommendations for educators, school administrators, policymakers, and mental health practitioners. These recommendations will be geared toward integrating mental health-promoting activities such as yoga and physical education into school curricula and national adolescent health programs. Additionally, policy suggestions will address infrastructure needs, teacher training, community involvement, and awareness campaigns. The ultimate goal is to support the development of a sustainable, inclusive, and culturally sensitive mental health framework that can be

scaled across Indian educational institutions to safeguard and enhance the psychological well-being of the nation's youth.

### 3. Review of Literature

#### 3.1 Yoga and mental health

Yoga, an ancient Indian practice that combines physical postures (asanas), breath control (pranayama), and meditation (dhyana), has increasingly been recognized for its profound impact on mental health, particularly among adolescents. Studies such as Telles *et al.* (2012) <sup>[1]</sup> have demonstrated that consistent yoga practice enhances cognitive functions like attention span and concentration, which are crucial during the adolescent years when academic and social pressures peak. Similarly, research by Khalsa *et al.* (2015) <sup>[2]</sup> indicates that adolescents engaging in structured yoga programs experience a significant reduction in stress levels and improvement in emotional regulation.

The underlying physiological mechanism of yoga's effectiveness lies in its activation of the parasympathetic nervous system, often referred to as the "rest-and-digest" system. When individuals engage in breath-regulated practices and meditative techniques, it induces a state of relaxation by slowing the heart rate, reducing blood pressure, and lowering cortisol the primary stress hormone. This autonomic shift not only improves emotional stability but also promotes a calm mental state conducive to better decision-making and interpersonal interactions. For adolescents grappling with identity development, peer dynamics, and academic stress, yoga offers a holistic tool that nurtures both physical composure and emotional resilience.

#### 3.2 Physical exercise and mental health

Regular physical exercise has long been established as a key factor in enhancing psychological well-being. Research by Sharma & Kaur (2018) <sup>[3]</sup> underscores the therapeutic value of physical activity in mitigating symptoms of depression and anxiety among adolescents. Physical exercises ranging from aerobic activities like running and swimming to strength training and team sports stimulate the production of endorphins, the body's natural mood-elevating chemicals. These neurochemicals act on the brain's opiate receptors to reduce pain perception and trigger a positive feeling in the body, often referred to as a "runner's high." Beyond biochemical benefits, physical exercise contributes to improved body image, self-confidence, and social integration. Adolescents who regularly participate in sports or physical activities often exhibit higher levels of self-esteem and social competence. Group-based physical activities foster a sense of belonging and teamwork, which are essential for positive adolescent development. Additionally, physical activity helps regulate sleep patterns and boosts energy levels, both of which are critical for mental clarity and emotional stability. Thus, incorporating regular exercise into the daily routine of adolescents serves as a proactive approach to preventing mental health disorders and enhancing overall psychological well-being.

#### 3.3 Comparative frameworks

While both yoga and physical exercise contribute positively to adolescent mental health, emerging comparative studies suggest distinct yet complementary benefits. Rao *et al.* (2016) <sup>[4]</sup> conducted an empirical investigation comparing the effects of yoga and traditional physical exercise on adolescent mental health parameters. Their findings revealed that yoga was particularly effective in addressing internalizing symptoms such as anxiety, stress, and depression. These benefits are

attributed to yoga's introspective nature, which fosters emotional awareness, mindfulness, and relaxation through controlled breathing and meditative focus.

On the other hand, physical exercise was found to be more effective in enhancing external domains of psychosocial functioning, including energy levels, motivation, and social interaction. Physical activities, especially team-based sports, promote goal-setting, cooperative behavior, and active engagement, which contribute to a sense of competence and social bonding.

This comparative framework underscores that while yoga excels in promoting emotional regulation and mental tranquility, physical exercise offers advantages in energizing the body, increasing social connectedness, and building self-efficacy. Together, they present a dual-faceted approach to mental wellness in adolescents, suggesting that a combination of both practices may yield the most comprehensive mental health outcomes.

### 4. Methodology

This study adopted a quasi-experimental, mixed-method research design to explore the comparative effects of yoga and physical exercise on adolescent mental health over a 12-week intervention period. The quasi-experimental nature of the design allowed for the implementation of structured interventions within naturally occurring school settings, while the mixed-method approach integrated both quantitative and qualitative data to offer a nuanced understanding of outcomes. Quantitative analysis provided measurable insights into variables such as stress, anxiety, depression, emotional regulation, and self-esteem, while qualitative methods such as focus group discussions and interviews captured subjective experiences, perceived benefits, and contextual influences.

The research sample consisted of 300 adolescents (150 males and 150 females), aged between 13 to 18 years, drawn from five co-educational schools located in diverse metropolitan and semi-urban areas including Delhi, Lucknow, Pune, and Dehradun. This geographic and demographic diversity was intended to enhance the generalizability of the findings within the Indian adolescent population, while still maintaining methodological control over key variables.

#### 4.1 Sampling technique

To ensure uniformity in socio-cultural and economic factors, purposive sampling was employed for the selection of schools. Only those institutions were included that represented a middle-income, urban demographic, shared similar academic curricula, and had the infrastructure to support both yoga and physical education programs.

Within each school, participating students were selected with the help of school counselors and guardians' consent. These students were then randomly assigned into three distinct groups to minimize selection bias:

- **Group A:** Yoga Intervention Group (n=100): Participants who received structured yoga training.
- **Group B:** Physical Exercise Group (n=100): Participants who engaged in a standardized physical activity regimen.
- **Group C:** Control Group (n=100): Participants who continued with their regular school routine and received no additional intervention. This tripartite grouping facilitated comparative analysis and ensured that differences in outcomes could be reasonably attributed to the type of intervention received.

#### 4.2 Intervention programs

The study designed two parallel intervention modules yoga and physical exercise each administered for 45 minutes daily



over 12 weeks (i.e., five days a week, during school hours). These interventions were standardized in consultation with field experts to maintain consistency across sites.

- **Yoga intervention program:** Conducted under the guidance of certified yoga instructors, this program included:
- **Asanas (yogic postures):** To promote physical flexibility, balance, and muscular strength.
- **Pranayama (breathing techniques):** Focused on enhancing breath control, oxygenation, and calming the nervous system.
- **Meditation and mindfulness:** Emphasized mental focus, relaxation, and self-awareness to reduce psychological stress and improve emotional clarity.
- **Physical exercise program:** Supervised by qualified physical education teachers, this regimen comprised:
  - Warm-up and stretching routines to prepare the body and prevent injury.
  - Aerobic activities like running, skipping, and circuit drills to promote cardiovascular fitness and energy expenditure.
  - Team-based sports and movement games where feasible, to enhance social interaction and engagement.
  - Both programs were designed to be age-appropriate, engaging, and adaptable for school implementation, ensuring high levels of participation and compliance.

#### 4.3 Tools for data collection

To evaluate the impact of interventions across key psychological variables, the study employed a combination of standardized psychometric scales and qualitative methods, as follows:

- **Depression Anxiety Stress Scales (DASS-21):** A widely validated tool for measuring the severity of depression, anxiety, and stress symptoms in adolescents.
- **Rosenberg self-esteem scale:** A 10-item scale assessing global self-worth and self-regard, suitable for young populations.
- **Emotional Regulation Questionnaire (ERQ):** Used to evaluate two primary emotional regulation strategies: cognitive reappraisal and expressive suppression.
- **Focus Group Discussions (FGDs):** Conducted with student participants post-intervention to gather collective insights, peer dynamics, and perceived changes.
- **In-depth interviews:** Held with selected participants, teachers, and parents to provide deeper narratives on behavior changes, emotional improvements, and lifestyle shifts observed during the study period.

These diverse tools provided both breadth and depth, allowing the research to measure not only psychological changes but also capture subjective experiences and feedback.

#### 4.4 Data analysis

The collected data were subjected to rigorous quantitative and qualitative analysis to test hypotheses and interpret findings.

##### Quantitative analysis

- Paired t-tests were conducted to examine within-group changes before and after the intervention.
- Analysis of Variance (ANOVA) was used to compare differences across the three groups (yoga, physical exercise, control) to assess the relative effectiveness of each intervention.
- Sub-group analyses were also performed based on gender and age to uncover patterns of differential impact.

##### Qualitative analysis

- Responses from FGDs and interviews were transcribed and coded thematically.
- Themes were generated inductively to identify recurring patterns, emotional responses, perceived benefits, challenges faced, and suggestions from participants.
- This process provided rich contextual insight into how adolescents internalized and responded to the interventions, supplementing the numerical data with human narratives.

Together, the mixed-method approach ensured a comprehensive, evidence-based understanding of how yoga and physical exercises influence adolescent mental health in the Indian context.

## 5. Results and Discussion

### 5.1 Pre-intervention mental health status

The baseline assessments conducted prior to the 12-week intervention revealed concerning trends in the mental health profiles of the adolescent participants. Across all three groups (Yoga (Group A), Physical Exercise (Group B), and Control (Group C)) a significant number of students exhibited elevated levels of academic stress, stemming from intense scholastic expectations, exam pressure, and parental expectations.

In addition, the participants reported moderate levels of anxiety, characterized by persistent worry, restlessness, and sleep disturbances, which are often exacerbated during adolescence due to hormonal changes and social pressures. A notable percentage of the sample also showed signs of low self-esteem, reflecting feelings of inadequacy, poor body image, and low self-worth. These findings affirmed the urgent need for structured interventions that address the psychological vulnerabilities of Indian adolescents in academic settings.

### 5.2 Post-intervention outcomes

Following the 12-week intervention period, post-assessment data revealed substantial improvements in several key mental health parameters among the intervention groups, with Group A (Yoga) consistently outperforming Group B (Physical Exercise), while the Control Group showed minimal changes. The results are summarized below:

Parameter	Group A (Yoga)	Group B (Exercise)	Group C (Control)
Stress reduction	42% decrease	31% decrease	5% decrease
Anxiety levels	38% decrease	27% decrease	3% decrease
Depression score	36% decrease	25% decrease	2% decrease
Self-esteem	46% increase	32% increase	4% increase
Emotional regulation	Improved by 51%	Improved by 28%	Improved by 6%

These figures suggest a statistically and practically significant improvement in mental well-being among adolescents exposed to both yoga and physical exercise, with yoga interventions producing more profound outcomes across all parameters.

### 5.3 Interpretation of results

Yoga vs. physical exercise both yoga and physical exercise interventions yielded positive effects on adolescent mental health. However, yoga demonstrated superior outcomes,

particularly in areas such as emotional regulation, anxiety reduction, and self-esteem enhancement. The breathwork and meditative components of yoga appeared to foster a deeper sense of inner calm, self-awareness, and emotional stability, which may explain the higher levels of improvement in Group A.

Participants in the yoga group reported enhanced mental clarity, improved focus, and a stronger ability to cope with stressful academic environments. In contrast, physical exercise, while beneficial, seemed to be more effective in boosting energy levels, motivation, and mood rather than reducing deeper emotional issues.

### Gender-based variations

The intervention outcomes also revealed notable gender-specific responses to the different modalities:

- Female participants in the yoga group exhibited marked improvements in emotional regulation, stress handling, and self-expression. They reported a stronger sense of inner balance and found the meditative practices particularly soothing.
- Male participants, especially those in the physical exercise group, showed better outcomes in social interaction, confidence, and peer bonding. Group-based sports and aerobic drills encouraged active engagement, competitiveness, and self-assurance.

These distinctions suggest that while yoga may be more attuned to the emotional and introspective needs of adolescent girls, physical activity resonates well with the social and kinetic preferences of boys, although both interventions benefit all genders to varying degrees.

### Qualitative findings

The qualitative data gathered through Focus Group Discussions and in-depth interviews enriched the numerical outcomes by providing vivid personal narratives:

- Yoga participants frequently expressed feelings of mental stillness, spiritual grounding, and enhanced self-discipline. Several students spoke of learning to “breathe through stress,” “detach from negative thoughts,” and “feel more centered and connected to themselves.”
- Physical exercise participants highlighted the exhilaration, energy surge, and team spirit that accompanied daily workouts. Many appreciated the sense of accomplishment after physical exertion and described an improvement in their ability to socialize and concentrate in academic tasks.

These reflections affirm that while yoga nurtures inward growth and emotional resilience, physical exercise reinforces outward expression, physical vitality, and social well-being. Both methods, when integrated thoughtfully into adolescent routines, offer powerful tools for strengthening youth mental health.

### 6. Conclusion

The findings of this study provide compelling evidence that both yoga and physical exercise serve as effective, non-pharmacological interventions for improving the mental health of Indian adolescents. Through measurable improvements in key psychological domains such as stress, anxiety, depression, emotional regulation, and self-esteem the research validates the positive impact of structured movement-based practices within school settings.

However, a comparative analysis reveals that yoga produced more pronounced and consistent effects, particularly in reducing anxiety levels, enhancing emotional regulation

skills, and boosting self-esteem among participants. The unique combination of physical postures, controlled breathing techniques, and mindfulness practices in yoga appears to stimulate the parasympathetic nervous system, cultivate mental clarity, and promote a deeper sense of inner balance benefits that are especially critical during the emotionally turbulent adolescent years.

Importantly, yoga’s effectiveness is amplified by its deep cultural resonance within the Indian context. As a practice rooted in India’s philosophical traditions, yoga not only aligns with the country’s heritage but also enjoys wide social acceptance, minimal cost, and adaptability across age groups and settings. These attributes make yoga particularly well-suited for scalable implementation in public health and educational interventions.

In contrast, while physical exercise contributed to improved mood, greater energy levels, and enhanced social interaction, its influence on internalizing symptoms (e.g., anxiety, low self-worth) was relatively moderate compared to yoga. This suggests that yoga may offer a more comprehensive and introspective approach to mental health enhancement, addressing both emotional resilience and self-perception.

In light of these findings, it is strongly recommended that yoga be formally integrated into the school curriculum as a structured, evidence-based approach to promoting adolescent mental health. Schools should consider:

- Allocating dedicated time for daily or weekly yoga sessions,
- Training physical education teachers and counselors in yoga instruction,
- Creating inclusive modules that cater to diverse student needs and abilities.

Such integration will not only contribute to academic readiness and emotional stability, but also foster long-term habits of self-care, mindfulness, and holistic wellness among India’s youth. As the nation faces growing concerns around adolescent mental health, yoga presents a culturally grounded and scientifically supported solution that is both sustainable and transformative.

### 7. Recommendations

Based on the empirical findings of this study, it is evident that structured yoga programs can significantly enhance adolescent mental health. To translate this evidence into sustainable action, the following multi-tiered recommendations are proposed, encompassing curriculum design, teacher training, policy formulation, family engagement, and future research:

#### 7.1 Curriculum integration: Embedding yoga in school timetables

In alignment with the National Education Policy (NEP) 2020, which emphasizes holistic development and the integration of physical, emotional, and spiritual well-being into the educational framework, it is recommended that compulsory yoga sessions be introduced at both middle and high school levels. These sessions should be formally incorporated into the daily or weekly school timetable rather than treated as optional extracurricular activities.

- Each session should include a balanced combination of asanas (physical postures), pranayama (breathing exercises), and dhyana (meditation practices).
- Age-appropriate and gender-sensitive modules should be developed to cater to varying levels of physical and emotional maturity.

- Curriculum planners should collaborate with certified yoga professionals and mental health experts to ensure that the content is both scientifically grounded and developmentally appropriate.

This structured integration will normalize mental health practices within academic spaces and offer adolescents consistent access to tools that support emotional regulation and cognitive clarity.

## 7.2 Teacher training: Capacity building for sustainable delivery

To ensure the successful implementation of yoga programs, there is a critical need to equip physical education (PE) teachers with foundational training in yoga practices and adolescent psychology.

- Specialized workshops and certification programs should be conducted in partnership with institutions like the Ministry of AYUSH, NCERT, and Yoga Certification Boards.
- Training should not only focus on physical instruction but also on the psychosocial dimensions of adolescence, enabling teachers to identify early signs of mental distress and provide empathetic support.
- Schools should encourage the development of in-house yoga instructors or coordinators, thereby institutionalizing the program and reducing dependence on external resources.

Empowered teachers serve as the first line of defense in promoting student well-being, and their involvement is key to the continuity and authenticity of school-based yoga initiatives.

## 7.3 Policy support: Institutional backing and funding mechanisms

Sustainable impact requires robust policy support at both the state and central levels. Education departments and school boards must take a proactive stance in institutionalizing yoga-based mental health programs across public and private schools.

Clear guidelines should be established regarding curriculum hours, assessment mechanisms (e.g., yoga-based life skills evaluations), and infrastructure requirements (e.g., dedicated spaces for practice).

- Budgetary allocations should support the procurement of yoga mats, teacher training resources, and evaluation tools.
- Policies must also include monitoring and evaluation frameworks to assess the impact of yoga on academic performance, mental health metrics, and overall student behavior.

Governmental endorsement and administrative coordination are essential to scale these programs beyond pilot initiatives and ensure equitable access across socio-economic strata.

## 7.4 Parental involvement: Extending well-being beyond school

Recognizing the role of family in adolescent mental health, schools should actively seek to involve parents in the well-being ecosystem. It is recommended that weekend or monthly yoga workshops be organized for parents and guardians, encouraging a culture of shared practice and intergenerational wellness.

- These workshops can include introductory yoga sessions, discussions on mental health awareness, and strategies for managing adolescent stress and screen time at home.

- Parental participation will reinforce the benefits of yoga in the home environment, making adolescents more likely to sustain the practice.
- Moreover, this initiative can help reduce stigma around mental health by promoting open conversations and mutual understanding between parents and children.

A collaborative model that connects the school, student, and family forms a powerful triad for nurturing mental health resilience.

## 7.5 Longitudinal studies: Advancing the evidence base

While the current study affirms the short-term efficacy of yoga and physical exercise on adolescent mental health, it is imperative to conduct long-term, large-scale research to deepen the evidence base and inform future interventions.

- Future studies should adopt longitudinal designs to track mental health outcomes over several months or years, assessing sustained impacts on anxiety, self-esteem, emotional maturity, academic performance, and social behavior.
- Comparative analyses across rural and urban populations, diverse cultural contexts, and different educational boards would provide a more representative understanding of yoga's adaptability and effectiveness.
- Research should also explore the neurobiological, behavioral, and academic correlates of consistent yoga practice in adolescence.

By expanding the scope of inquiry, longitudinal research can guide policy decisions, curriculum development, and community-based interventions with greater precision and cultural relevance.

A multifaceted approach encompassing curricular reform, educator empowerment, institutional policies, family engagement, and evidence-driven research is essential to harness the full potential of yoga as a transformative tool for adolescent mental health in India. With strategic implementation and continued advocacy, yoga can move from the margins to the mainstream of educational and public health initiatives, nurturing a generation that is not only academically competent but also emotionally resilient and holistically well.

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