



## IMPACT OF YOGA ON FLEXIBILITY AMONG ADOLESCENTS: A LITERATURE REVIEW

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### KEYWORDS :

#### INTRODUCTION

Flexibility is a key component of physical fitness and overall health, especially during adolescence—a period marked by rapid physical growth and musculoskeletal changes. Flexibility affects range of motion, posture, injury prevention, and performance in physical activities. Yoga, an ancient mind–body practice emphasizing physical postures (asanas), breath control (pranayama), and meditation, has been widely studied as a holistic intervention for improving physical fitness outcomes, including flexibility, across populations. Although much research has focused on adults, recent studies have begun to evaluate yoga's effects on children and adolescents, providing evidence that it may enhance flexibility as part of physical fitness development in school settings and sports contexts.

This review examines existing empirical studies and literature to summarize the impact of yoga on flexibility among adolescents. It explores mechanisms, observed outcomes, limitations, and implications for future research and practice.

#### Defining Flexibility and Its Importance in Adolescents

Flexibility refers to the ability of a joint or series of joints to move through a full range of motion without pain or restriction. It is influenced by muscle and connective tissue elasticity, joint structure, nervous system regulation, and training practices. During adolescence (typically ages 10–19), growth spurts can temporarily reduce flexibility and increase injury risk if mobility is not maintained through regular movement and stretching activities. Improved flexibility contributes to better posture, reduced muscle tension, enhanced athletic performance, and overall musculoskeletal health.

Physical education programs often include stretching and flexibility training to mitigate the negative effects of static lifestyles, especially for students with prolonged sitting during school hours. Yoga, which combines stretching with mindful movement and breath awareness, has gained recognition as a potentially effective modality for improving flexibility among youth.

#### Mechanisms by Which Yoga May Improve Flexibility

Yoga's potential effects on flexibility stem from its incorporation of sustained stretches, controlled transitions between postures, and mindful breathing techniques. Traditional asanas stretch major muscle groups (e.g., hamstrings, quadriceps, hip flexors, back extensors) and engage connective tissues like ligaments and tendons, which can increase range of motion over time. Additionally, breathing practices and mindfulness may decrease muscular tension and facilitate deeper relaxation during stretches, perhaps enabling greater flexibility gains than stretching alone.

The neuromuscular component of yoga—where movement is synchronized with breath—may also improve proprioception (body awareness) and reduce inhibitory reflexes that limit muscle lengthening. While the precise physiological mechanisms are still being clarified, studies consistently recognize yoga's role in affecting flexibility through both physical and psychological pathways.

#### Empirical Evidence: Yoga and Flexibility in Adolescents School-Based and Youth Physical Fitness Interventions

Several controlled and quasi-experimental studies have investigated the effects of regular yoga practice on flexibility in school-aged adolescents:

##### 1. Effects of Yoga on Flexibility of School Children

A recent empirical study reviewed physical effects of yoga among school students, focusing particularly on flexibility outcomes. Findings showed that prolonged yoga practice enhanced flexibility in joints such as the lower back, hips, shoulders, and knees, and improved

students' range of motion compared to baseline measures. The review highlighted that yoga poses, when practiced consistently, contribute to flexibility improvements that help reduce the risk of muscle strain and postural issues associated with sedentary behavior typical among students.

##### 2. Yoga and Physical Fitness Parameters in Preadolescents

A randomized controlled trial conducted on preadolescent children also reported that a structured yoga intervention resulted in significant improvements in flexibility, along with other physical fitness parameters such as balance and endurance. This study underscores that yoga can be effectively integrated into school curricula to enhance overall physical fitness during a critical stage of growth.

##### 3. Yoga Practice Among Children Aged 10–12 Years

Another quasi-experimental study assessing yoga's effects on youths aged 10–12 found statistically significant improvements in flexibility measures post-intervention (e.g., sit-and-reach tests), suggesting that regular yoga sessions (40 min, 1–3 times per week for eight weeks) positively influence flexibility alongside other motor skills like balance.

#### Broader Adolescent and Special Populations Evidence

Complementing results in general youth populations, studies involving specific adolescent groups also provide evidence for yoga's flexibility benefits:

##### 1. Remotely Delivered Yoga for Adolescents With ASD

A pilot feasibility study among adolescents with autism spectrum disorder (ASD) reported significant increases in flexibility (approximately 40.3%) after 12 weeks of yoga practice, along with improvements in balance and strength. Despite being a clinical subgroup, the findings support yoga's potential to increase flexibility even among individuals with initially lower baseline activity levels.

##### 2. Effects of Short-Term Yoga Practice

Research evaluating six weeks of yoga practice in adolescents demonstrated significant improvements in flexibility alongside gains in other fitness parameters (e.g., muscular strength, respiratory function), indicating that even relatively short yoga programs can yield meaningful changes in physical abilities among youth.

##### 3. Similar Findings in Older Student Groups

Studies conducted among college student populations—though not strictly adolescents—also show increased flexibility following yoga practices, indicating that positive effects may extend throughout late adolescence and young adulthood. These studies report enhanced joint range of motion following consistent yoga participation.

#### Synthesis of Findings

Across diverse study designs and populations, the evidence suggests that:

- Regular yoga practice is associated with improvements in flexibility among children and adolescents, as measured by objective physical tests such as sit-and-reach and joint range of motion assessments.
- Structured school-based yoga programs can be effective when implemented within physical education curricula, supporting flexibility development alongside other fitness components.
- Yoga's effects on flexibility are observable within relatively short time frames (e.g., 6–12 weeks), though intervention specifics (frequency, duration, intensity) vary across studies.
- Positive outcomes have been reported across typical adolescents and special populations (e.g., ASD), indicating broad applicability.

These empirical results are consistent with theoretical expectations of yoga as a stretching-based activity that can counteract sedentary postural adaptations common in youth.

### Limitations of Existing Research

Despite encouraging findings, several limitations should be noted:

1. **Methodological Variation:** Studies differ widely in design, intervention length, yoga styles, and outcome measures, making comparisons challenging and reducing the precision of aggregated conclusions.
2. **Small Sample Sizes:** Many studies involve limited numbers of participants or lack randomized control designs, limiting statistical power and generalizability.
3. **Flexibility vs. Overall Fitness:** In some research, flexibility outcomes are reported alongside other physical or psychological variables, making it difficult to isolate the specific effects of yoga on flexibility.
4. **Lack of Long-Term Follow-Up:** Few studies assess whether gains in flexibility are maintained beyond the intervention period.

Addressing these limitations through larger, standardized research protocols will strengthen understanding of yoga's role in adolescent physical development.

### Implications for Practice and Future Research

Given the consistent positive trends in existing studies, educators and physical education policymakers should consider incorporating yoga modules into school programs as a cost-effective, low-resource method to support flexibility and overall fitness in adolescents.

Future Research Should Aim to:

- Standardize yoga intervention protocols (frequency, duration, asana selection) for clearer comparisons across studies.
- Include large-scale randomized controlled trials focusing on flexibility as a primary outcome.
- Evaluate long-term maintenance of flexibility gains post-program.
- Investigate mechanistic pathways by which yoga enhances flexibility at physiological and neuromuscular levels.

### CONCLUSION

Available empirical evidence suggests that yoga practice can positively influence flexibility among adolescents, contributing to improved physical fitness and potentially reducing injury risk associated with poor mobility. While research to date has limitations, the consistent observation of flexibility improvements across studies highlights yoga's potential as a practical intervention in youth physical education. Continued rigorous research will clarify best practices for implementation and optimize physical and developmental benefits for adolescent populations.

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