

Methodology for improving special endurance qualities in young basketball players

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Abstract: This article explores effective methodologies aimed at developing special endurance qualities in young basketball players. Given the high-intensity and dynamic nature of basketball, endurance plays a critical role in maintaining performance throughout the game. The research focuses on specialized training programs that enhance aerobic and anaerobic capacity, muscular endurance, and recovery speed. Various methods, including interval training, circuit training, and sport-specific drills, are analyzed for their impact on young athletes. The article also discusses age-appropriate load management and injury prevention strategies. The results highlight that a structured and scientifically grounded approach significantly improves endurance, leading to better athletic performance and reduced fatigue during matches.

Keywords: special endurance, young basketball players, training methodology, interval training, circuit training, aerobic capacity, anaerobic endurance, sports performance, youth sports, load management, injury prevention

Introduction: In modern basketball, where the pace of the game is constantly increasing, the physical preparedness of players, particularly their endurance, has become a decisive factor in achieving competitive success. Basketball is characterized by frequent changes in movement intensity—sprinting, jumping, abrupt stops, and rapid directional shifts—which place significant demands on a player's special endurance. For young athletes, the development of these endurance qualities not only enhances performance during games but also lays the foundation for long-term athletic growth and injury prevention.

Special endurance refers to the ability to sustain high-intensity efforts specific to a sport over prolonged periods without a significant decline in performance. In basketball, this involves maintaining speed, agility, and technical precision throughout all quarters of a match. However, traditional general endurance training methods are insufficient for meeting the specific physiological and biomechanical

demands of basketball. Therefore, it is essential to implement targeted methodologies that address the unique energy systems and muscle groups engaged during gameplay.

The importance of developing special endurance in young basketball players cannot be overstated, as this age group represents a critical period for physical and functional adaptation. Properly structured endurance training not only improves athletic output but also contributes to faster recovery, greater resilience against fatigue, and enhanced concentration during decisive game moments.

This article aims to analyze and present effective methodologies for improving special endurance qualities in young basketball players, focusing on scientifically-based practices that align with the physiological characteristics of adolescent athletes. By integrating modern training techniques with sport-specific demands, coaches and trainers can optimize the development of endurance, ultimately fostering better performance and long-term athletic potential.

Relevance of the Work

The development of special endurance qualities in young basketball players is a pressing issue in modern sports science and coaching practice. As basketball evolves into an increasingly fast-paced and physically demanding sport, players are required to sustain high levels of performance throughout extended periods of play. For young athletes, whose physiological systems are still developing, the implementation of effective endurance training methods is crucial for both immediate performance and long-term athletic progression.

Current research indicates that endurance is not only vital for maintaining physical output but also for supporting cognitive functions such as decision-making, reaction time, and tactical awareness during games. Despite its importance, many youth training programs still rely on outdated or generalized conditioning techniques that fail to meet the specific demands of basketball.

Moreover, improper endurance training can lead to overtraining, fatigue, and a higher risk of injury, especially in adolescents. Therefore, there is a growing need to design age-appropriate, sport-specific methodologies that enhance special endurance while considering the developmental characteristics of young players.

This work is relevant as it addresses these gaps by offering a structured approach to improving special endurance in youth basketball. It integrates modern training principles, scientific findings, and practical applications, providing coaches

and sports practitioners with effective tools to enhance athletic performance safely and efficiently.

Objective

The primary objective of this study is to develop and substantiate effective methodologies for improving special endurance qualities in young basketball players.

Specifically, the study aims to:

- Identify the key components of special endurance relevant to basketball performance.
- Analyze existing training methods and their applicability to youth athletes.
- Design a comprehensive, age-appropriate training program focused on enhancing aerobic and anaerobic endurance.
- Evaluate the effectiveness of sport-specific endurance drills, interval training, and circuit training in improving performance.
- Provide recommendations for optimizing load management and preventing overtraining in young basketball players.
- Contribute to the scientific and practical foundations of physical training in youth sports by offering evidence-based strategies for endurance development.

Materials and Research Methods

The research was conducted over a 12-week period involving **30 young basketball players** aged between **13 and 16 years**, who were actively training in a sports school. The participants were divided into two groups:

- **Experimental Group (15 players):** Received a specialized endurance training program.
- **Control Group (15 players):** Continued with their standard basketball training routine without additional endurance-specific interventions.

Research Methods:

1. **Initial and Final Testing:**
 - **Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1):** To assess aerobic and anaerobic endurance.
 - **30-Second Shuttle Run Test:** To evaluate high-intensity repeatability.
 - **Heart Rate Monitoring:** Used to track recovery time post-exercise.

- **Game Performance Analysis:** Observation of endurance-related performance during matches (e.g., number of effective sprints, drop in intensity in later quarters).
- 2. **Training Methodology for the Experimental Group:**
 - **Interval Training:** Short bursts of high-intensity running (15-30 seconds) followed by active recovery.
 - **Circuit Training:** Combination of strength and cardio exercises targeting basketball-specific movements (e.g., jump squats, defensive slides, sprint drills).
 - **Sport-Specific Drills:** Continuous fast-break drills, full-court pressing, and transition exercises designed to mimic in-game endurance demands.
 - **Training Frequency:** 3 endurance-focused sessions per week integrated into regular basketball practices.
- 3. **Monitoring Tools:**
 - Heart rate monitors and perceived exertion scales (RPE) were used to ensure optimal load management.
 - Weekly adjustments were made based on individual performance and recovery rates.

Results and Discussion

After 12 weeks, the data demonstrated a significant improvement in the special endurance qualities of the **Experimental Group** compared to the **Control Group**.

Key Findings:

• Yo-Yo IR1 Test:

- Experimental Group: Average improvement of **22%** in total distance covered.
- Control Group: Minor improvement of **6%**, attributed to general physical activity.

• 30-Second Shuttle Run:

- Experimental Group reduced fatigue rate by **18%**, maintaining higher speeds throughout repetitions.
- Control Group showed only a **4%** improvement.

• Heart Rate Recovery:

- Experimental Group’s average recovery time decreased by **25%**, indicating better cardiovascular efficiency.

- Control Group showed negligible change.

- **Game Performance:**

- Coaches observed that players in the Experimental Group sustained higher levels of activity, particularly in the third and fourth quarters, with fewer substitutions due to fatigue.

- The number of successful fast breaks and defensive recoveries increased by **30%** in the Experimental Group.

Discussion:

The results confirm that a targeted, sport-specific endurance training program significantly enhances special endurance in young basketball players. The combination of interval and circuit training, when aligned with basketball-specific drills, proved to be more effective than standard training alone.

Importantly, the methodology respected the physiological limits of adolescent athletes, ensuring progressive overload without leading to overtraining or injury. Regular monitoring allowed for individualized adjustments, which contributed to the overall success of the program.

These findings align with contemporary sports science literature, which emphasizes the superiority of high-intensity interval training (HIIT) and functional circuit training in developing endurance relevant to team sports like basketball.

Furthermore, improved endurance not only benefited physical performance but also contributed to better decision-making and tactical execution during games, as players experienced less mental fatigue.

Conclusion: The conducted research clearly demonstrates that the implementation of a structured, sport-specific methodology significantly improves special endurance qualities in young basketball players. Traditional training approaches, which often focus on general physical conditioning, are insufficient to meet the dynamic and high-intensity demands of modern basketball.

By integrating interval training, circuit-based exercises, and basketball-specific drills into regular practice sessions, young athletes were able to enhance both their aerobic and anaerobic capacities. This led to noticeable improvements in their ability to maintain high performance throughout the duration of matches, reduce fatigue, and recover more efficiently between high-intensity efforts.

Moreover, the methodology proved to be safe and adaptable to the physiological characteristics of adolescents, minimizing the risk of overtraining and injuries. The positive correlation between improved endurance and in-game performance highlights the importance of targeted physical preparation in youth basketball development programs.

In conclusion, coaches and sports practitioners are encouraged to adopt scientifically-based endurance training strategies tailored to the specific needs of basketball. Such an approach not only boosts physical performance but also contributes to the overall athletic growth and long-term success of young players.

Future research should focus on refining these methodologies further, exploring individualized training loads, and integrating modern technologies such as wearable fitness trackers for enhanced monitoring and optimization of training processes.

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