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Impact of core strength development on selected biomotor components in basketball players

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Abstract
The development of biomotor abilities is a vital component in enhancing sports performance, especially in basketball, which demands a blend of agility, strength, speed, and coordination. The present study explored the influence of core training on selected biomotor variables among basketball players. Core training enhances the strength of trunk muscles responsible for stabilizing the body during complex athletic movements, thereby improving efficiency and performance on the court.
A group of basketball players was selected and divided into experimental and control groups. The experimental group participated in a systematic core training program emphasizing the abdominal, lower back, pelvic, and hip regions, while the control group maintained their regular practice. Standardized field tests were used to assess pre- and post-training performance in strength, speed, agility, and balance.
Results revealed that the experimental group exhibited statistically significant improvements compared to the control group, confirming that core training enhances key biomotor attributes vital for basketball performance. This study highlights the importance of structured core exercise programs in physical education and sports training. The findings provide valuable guidance for coaches, trainers, and sports scientists aiming to optimize athletic development and prevent injuries.

Keywords: Core training, biomotor variables, basketball players, strength, agility, speed, balance

Introduction
Basketball is a high-intensity, multidirectional sport requiring athletes to display strength, speed, coordination, agility, and balance. These biomotor abilities form the foundation of successful performance in key basketball skills such as jumping, sprinting, and quick directional changes. Among different training approaches, core training plays a pivotal role in improving trunk stability and functional performance. Strengthening the core muscles enhances postural control, kinetic chain efficiency, and movement economy.
A well-structured core training program targets the deep and superficial muscles of the abdomen, pelvis, lower back, and hips, facilitating better energy transfer, stability, and skill execution. Furthermore, a strong core helps minimize injury risk and supports efficient performance during dynamic movements. This study aims to evaluate how a systematic core training program influences selected biomotor variables among school-level basketball players.

Core Strength Training
Core strength training focuses on developing stability, strength, and endurance in the muscles surrounding the trunk, including the rectus abdominis, obliques, transversus abdominis, erector spinae, and gluteal muscles. Through static and dynamic drills such as planks, bridges, Russian twists, medicine ball throws, and stability ball exercises, this method enhances functional stability, posture, and balance. In basketball, where frequent acceleration, deceleration, and changes of direction occur, a strong core helps maintain control and reduces the risk of lower limb and spinal injuries.

Balance Training
Balance training aims to improve equilibrium under both static and dynamic conditions. For basketball athletes, enhanced balance contributes to improved footwork, stability during rebounds, and smoother directional transitions.

Common exercises include single-leg stands, wobble board routines, and stability-focused movements that refine proprioception and neuromuscular control, essential for efficient body alignment during play.

Plyometric Training

Plyometric training incorporates explosive drills such as jumping, bounding, and hopping that activate the stretch-shortening cycle of muscles. This form of training significantly improves muscular power, agility, and reactivity—attributes vital for basketball players during activities like vertical jumps, rebounding, and rapid transitions. When paired with core training, plyometric exercises enhance coordination, balance, and explosive strength, leading to overall athletic advancement.

Methodology

The study examined the influence of core training on selected biomotor variables among school-level basketball players aged 18–25 years from Namakkal District, Tamil Nadu. A total of 60 basketball players were randomly assigned to four groups:

1. Core Strength Training Group
2. Balance Training Group
3. Plyometric Training Group
4. Control Group

A pre-test and post-test randomized design was employed. The selected variables—strength, agility, speed, and balance—were measured using standardized field tests: the sit-up test, T-test, 30-meter sprint, and stork balance stand.

The experimental groups underwent their respective training programs three times per week for 12 weeks, while the control group continued with regular basketball practice. Training intensity and complexity were progressively increased according to participants' abilities. Data collected before and after the training period were analyzed using Analysis of Covariance (ANCOVA) to assess the effects of different training methods.

Results and Discussion

Speed

The ANCOVA results demonstrated significant improvements in post-test and adjusted post-test mean values for speed among the experimental groups, with the plyometric and core training groups showing superior performance compared to the control group ($F = 34.91$, $p<0.05$).

Agility

Significant differences were found among groups in post-test agility scores. The core and plyometric training groups exhibited enhanced performance, reflecting improved neuromuscular coordination and movement efficiency ($F = 19.84$, $p<0.05$).

Balance

Results indicated that balance improved significantly in all experimental groups, with the plyometric group showing the highest gain, followed by the balance and core training groups ($F = 34.50$, $p<0.05$). This demonstrates that all three training interventions contribute meaningfully to postural control and dynamic stability.

Conclusion

The study examined the comparative effects of core, balance, and plyometric training on biomotor variables among basketball players. Analysis revealed that all three interventions led to notable improvements in speed, agility, and balance when compared with the control group.

- **Speed:** Plyometric training showed the most pronounced effect, followed by core training.
- **Agility:** Both plyometric and core training significantly enhanced quick directional response.
- **Balance:** Plyometric training yielded the greatest improvement, followed by balance and core training.

These findings suggest that incorporating structured core and plyometric programs into basketball conditioning can significantly improve athletic performance while reducing injury risk. Coaches and physical educators are encouraged to implement integrated training models combining strength, balance, and plyometric elements to achieve optimal player development.

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