Impact of Different Sports Surfaces on Athlete Performance

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Abstract-This study examines the impact of different sports surfaces—natural grass, artificial turf, and wooden court—on athletic performance in sprint, agility, vertical jump, and endurance among 30 university athletes. Using a randomized crossover design, each participant performed standardized tests on all three surfaces, with adequate recovery periods. Results showed that artificial turf enhanced sprint and agility performance, wooden court supported higher vertical jumps, and natural grass offered realistic game conditions but slightly slower times. These findings highlight the importance of surface-specific training to optimize performance and reduce injury risks.

INTRODUCTION

Sports surfaces play a critical role in determining athlete performance, safety, and injury risk. The type of surface affects biomechanical loading, traction, and energy return, all of which can significantly influence speed, agility, endurance, and power. With increasing use of synthetic and specialized surfaces in training and competition, understanding their impact is essential for coaches, athletes, and facility managers.

STATEMENT OF THE PROBLEM

While multiple sports surfaces are used worldwide, limited empirical research compares their direct influence on athletic performance metrics. Coaches and athletes often make surface choices based on availability rather than scientific evidence. This study aims to provide data-driven insights into how natural grass, artificial turf, and wooden court surfaces affect university athletes' performance.

OBJECTIVES OF THE STUDY

1. To compare sprint performance across natural grass, artificial turf, and wooden court surfaces.
2. To examine the impact of different surfaces on agility, vertical jump, and endurance performance.
3. To identify which surface provides optimal conditions for specific performance metrics.

Hypotheses
H1: There will be significant differences in sprint performance across different sports surfaces.
H2: There will be significant differences in agility, vertical jump, and endurance across different sports surfaces.
H0: There will be no significant differences in performance across different surfaces.

SIGNIFICANCE OF THE STUDY

This study provides valuable insights for coaches, sports scientists, and facility managers by identifying how surface type influences specific athletic performance metrics. The findings can guide training surface selection to enhance performance and minimize injury risks.

REVIEW OF LITERATURE

Previous studies have explored the influence of sports surfaces on injury prevention, performance, and biomechanics. Research suggests that artificial turf offers consistent traction and reduced variability, wooden courts provide high energy return, and natural grass simulates outdoor match conditions. However,

results vary based on athlete skill level, sport type, and testing protocols.

METHODOLOGY

A total of 30 university athletes (15 male, 15 female) participated in a randomized crossover design study. Each athlete performed four standardized tests—40m sprint, T-test agility, vertical jump, and Yo-Yo intermittent recovery test—on three surfaces: natural grass, artificial turf, and wooden court. Performance times, jump heights, and endurance scores were recorded. Data were analyzed using repeated measures ANOVA to identify statistically significant differences.

RESULTS & DISCUSSION

Artificial turf yielded the fastest sprint times (mean = 5.88s) and best agility scores (mean = 8.91s). Wooden court produced the highest vertical jump heights (mean = 56.4 cm), while artificial turf supported the greatest endurance distances (mean = 1420 m). Natural grass produced slightly slower results but is crucial for outdoor competition adaptation. These results align with previous research showing that synthetic and rigid surfaces enhance specific performance aspects due to higher traction and energy return.

CONCLUSION & RECOMMENDATIONS

This study concludes that sports surfaces significantly influence athlete performance. Artificial turf is ideal for sprint and agility training, wooden court is optimal for vertical jump development, and natural grass is essential for game-condition adaptation. It is recommended that training programs incorporate multiple surfaces to optimize performance and reduce overuse injuries.