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Research Paper

Immediate Effect on Q Angle After Application of Kinesio Taping Among Intermediate Badminton Players in Lunge Phase: An Experimental Study

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ABSTRACT

Background: Badminton is a high-paced racquet sport associated with significant overuse injuries of the lower extremity. Abnormal Q-angle in badminton players during the lunge phase is a recognised risk factor for patellofemoral pain syndrome (PFPS) and related knee pathologies. Kinesio taping (KT) has been widely used as a therapeutic intervention for pain management and functional improvement; however, its immediate effect on dynamic Q-angle in athletes remains unclear.
Objective: To study the immediate effect on Q-angle after application of Kinesio taping among intermediate badminton players in the lunge phase using Kinovea motion analysis software.
Materials and Methods: An experimental pre-post study design was employed. Intermediate badminton players with abnormal Q-angle and normal BMI (18–24.9 kg/m²) were recruited from sports complexes in and around Pune using convenience sampling. Pre-taping Q-angle was measured during the lunge phase using Kinovea video analysis software, followed by Kinesio tape application and post-taping reassessment under identical conditions. A paired t-test was used for statistical analysis ($p \leq 0.05$).
Results: The mean pre-taping Q-angle was 18.83° and post-taping Q-angle was 18.88°. Statistical analysis using a paired t-test showed no significant difference in Q-angle following Kinesio tape application ($p > 0.05$).
Conclusion: Kinesio taping does not produce a statistically significant immediate change in dynamic Q-angle during the lunge phase in intermediate badminton players. Its primary benefits appear to be pain relief, improved proprioception, and functional support rather than direct biomechanical realignment.

Key Words: Q-angle, Kinesio taping, Badminton, Lunge phase, Patellofemoral pain syndrome, Kinovea software

INTRODUCTION

Badminton is a high-paced game and is considered the fastest of the racquet sports.[1] Although badminton biomechanics have not been the subject of extensive scientific research, studies have determined the mechanisms of power generation especially in jump smashes and analysed the efficiency of different lunge techniques that are a key to success in repetitive shuttlecock retrieval.[1] Injuries in badminton are common despite it not being a contact sport. Competitive players are prone to overuse injuries of the

lower limb, placing them at risk of non-contact traumatic injuries to joints and muscle-tendon units.[1] Injury prevention in any sport is a sequence of four steps: injury surveillance to establish the extent of the problem, identifying the aetiology and mechanisms of injury, introducing preventive measures, and evaluating their effectiveness.[3]

The quadriceps angle (Q-angle) is defined as the angle formed between an imaginary line connecting the anterior superior iliac spine (ASIS) to the patella midpoint and a proximal projection of the line running from the tibial tubercle to the patellar centre. A typical Q-angle is 12 degrees for men and 17 degrees for women.[6] Increased Q-angle is considered a risk factor for patellofemoral pain (PFP), patellar subluxation and dislocation, chondromalacia patellae, knee osteoarthritis, ACL injury, patellar instability, disturbances in dynamic balance, and ankle sprains. [8,9]

Repetitive lunging is an essential part of badminton. The lunge movement allows the player to rapidly reach the shuttlecock and form a secure base from which to play the necessary shot. Rapid and repetitive badminton lunges and jumps produce strenuous impact loading on the lower extremities, resulting in overuse knee injuries.[1] Lunges are common in badminton and related to a high risk of overuse injuries such as patellar and Achilles tendinopathies.[4]

Kinesio tape (KT) is widely used in rehabilitation and sports medicine for pain management, proprioceptive enhancement, and functional support. Despite its widespread clinical use, evidence regarding its effect on dynamic Q-angle in sport-specific movements remains limited.[11]

Kinovea is a free video analysis software capable of performing reliable biomechanical motion analysis without physical sensors or reflective markers, validated as a low-cost alternative for sports biomechanics.[5]

This study aims to analyse the movement pattern and introduce a quick taping intervention for Q-angle correction, examining its immediate effect during the badminton lunge phase using Kinovea software.

MATERIALS AND METHODS

Study Design

An experimental, pre-post study design was used. The study was conducted over a period of six months at sports complexes in and around Pune, Maharashtra, India, following ethical clearance from the Institutional Ethics Committee of P.E.S. Modern College of Physiotherapy.

Participants

Intermediate badminton players were recruited using convenience sampling from badminton academies in Pune. Prior written informed consent was obtained from all participants. Assent was additionally obtained for participants under 18 years through their parent or guardian.

Inclusion Criteria

- Intermediate badminton players with abnormal Q-angle
- Both males and females
- Normal BMI (18 kg/m² to 24.9 kg/m²)
- Sit and reach test result at or above the normative value
- Players with instability in the lower limb during the lunge phase

Exclusion Criteria

- Players with recent lower limb injuries
- Patellar deformities (patella alta, patella baja)
- Players with generalised hypermobility
- Players with lower limb fractures
- Players with any other lower limb deformities

Materials Used

- Camera and camera stand
- Kinesio tape
- Kinovea motion analysis software
- Consent and data recording forms

Outcome Measure

The primary outcome measure was the Q-angle during the lunge phase, assessed using Kinovea motion analysis software. Nor Muaza Nor Adnan et al. validated Kinovea as a reliable, low-cost alternative to sophisticated motion capture systems, reporting less than 10% variance compared to the Hawk-Cortex system, confirming its repeatability and reliability for sports biomechanical analysis.[5]

Procedure

The study commenced after obtaining ethical clearance from the Institutional Ethics Committee. Participants were enrolled from various badminton academies after selection based on inclusion and exclusion criteria. The purpose of the study was explained to all participants and written informed consent was obtained.

Each participant performed their routine warm-up exercises followed by a sit-and-reach flexibility test. Players were then allowed to play two to three sets to establish baseline conditions. Pre-taping Q-angle was measured in the lunge phase using Kinovea software by recording video footage from a standardized frontal plane camera position.

Following pre-intervention assessment, Kinesio tape was applied for Q-angle correction using the standard patellar alignment taping technique. Post-taping Q-angle was subsequently measured under identical conditions using Kinovea software. All data were collected and tabulated for statistical analysis.

Statistical Methods

Data were entered in an Excel spreadsheet, tabulated and subjected to statistical analysis using Python statistical tools and IBM SPSS software. A paired t-test was used to compare Q-angle values pre- and post-application of Kinesio tape. The level of significance was set at $p \leq 0.05$. The paired t-test was selected as it is appropriate for comparing two related measurements from the same group of participants.

RESULTS

The study was conducted to determine the immediate effect of Kinesio taping on Q-angle in the lunge phase in intermediate badminton players using Kinovea software. The p value $\leq$ 0.05 was considered statistically significant.

Gender Distribution

Gender	Male	Female
Total	32	28

Pre-Post Q-Angle Analysis

The mean pre-taping Q-angle was 18.83° and the mean post-taping Q-angle was 18.88°. Statistical analysis using the paired t-test showed no statistically significant difference in Q-angle following Kinesio tape application ($p > 0.05$), indicating that Kinesio taping did not produce an immediate significant change in Q-angle during the lunge phase.

Outcome measure	Pre-mean	SD	Post-mean	SD	P-value
Kinovea	18.8317	3.379122926	18.8767	3.48917778	>0.05 (no significant effect)

DISCUSSION

The present experimental study was carried out to determine whether Kinesio tape could cause an immediate improvement in Q-angle after its application among intermediate badminton players in the lunge phase. Kinovea software was used as the outcome measure for pre- and post-intervention Q-angle assessment.

Badminton is a high-paced game considered the fastest of the racquet sports.[1] Although badminton biomechanics have not been extensively studied, research has determined mechanisms of power generation in jump smashes and the efficiency of lunge techniques that are key to success in repetitive shuttlecock retrieval.[1]

Q-angle is defined as the angle formed between the line from the ASIS to the patella midpoint and the line from the tibial tubercle to the patellar centre. Increased Q-angle is considered a risk factor for patellofemoral pain, patellar subluxation and dislocation, chondromalacia patellae, knee osteoarthritis, overuse injuries, ACL injury, patellar instability, and disturbances in dynamic balance. [8,9] Dynamic Q-angle is measured through the knee joint's range of flexion with or without dynamic activity using frontal plane projection angle (FPPA).

Chang et al. (2015) conducted a systematic review and meta-analysis comparing Kinesio Taping and McConnell Taping for PFPS. Their findings demonstrated that both taping methods were equally effective in reducing pain and improving function, with no significant difference between the two techniques.[11] This evidence provided the rationale for selecting Kinesio tape in the present study.

The result of the present study showed no statistically significant change in Q-angle following Kinesio tape application. The mean Q-angle pre and post (18.83° and 18.88° respectively) showed no significant difference. This is consistent with findings by Lins et al. (2013), who found no change in neuromuscular performance, functional alignment, or Q-angle following Kinesio taping in healthy adults.[13] Even in studies reporting slight improvements in movement control (approximately 0.7° reductions), these are consistently regarded as clinically insignificant and do not constitute structural changes.

A systematic review and meta-analysis by Hailong Jiao et al. noted that Kinesio tape reduced VAS pain scores and increased Kujala AKPS scores in PFPS patients; however, knee joint position error was not significantly different among Kinesio-taped subjects.[14] This further supports the finding that Kinesio tape does not cause a significant difference in Q-angle.

The present findings suggest that Kinesio taping, while beneficial for pain reduction and proprioceptive enhancement, does not immediately correct dynamic Q-angle biomechanics.[8] Future research should explore longer-term interventions or combined therapeutic approaches for Q-angle correction in athletes.

CONCLUSION

The present study demonstrated that Kinesio taping does not produce a statistically significant immediate change in Q-angle during the lunge phase in intermediate badminton players. Kinesio taping does not significantly alter Q-angle or bony alignment. Its primary benefits lie in reducing pain, improving body awareness and proprioception, and offering additional support during athletic activity and rehabilitation. Future studies should investigate the long-term effects of Kinesio taping, its application in athletes at different competitive levels, and the use of alternative taping techniques with varying tape tensions.

Declaration by Authors

Ethical Approval: Approved

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