

Official Title  
Effects of Mulligan Mobilization with movement  
Versus Kinesiotaping and Placebo on knee  
function and injury -related Outcomes in  
Basketball Players: A Parallel -Group Randomized  
Controlled Trial

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# 1. Study Protocol

**Title of the Study:** Effects of Mulligan Mobilization with movement versus Kinesiotaping and Placebo on knee function and injury -Related Outcomes in Basketball Players: A parallel-group randomized controlled trial.

**Protocol Version & Date:** (Version 1.0, Date 10/12/2024).

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## Introduction

Basketball is a contact sport that requires rapid and high-intensity movements such as jumping, changing direction, turning, landing, running (Sokoli, S. V., et al., 2024), Rubin, E. B., et al., 2021; Hannington, M. et al., 2022; Chang, L. L. Y., 2020). These maneuvers result in musculoskeletal injuries (Tummala, S. V., et al., 2022) and the highest frequency of knee injuries (Tummala, S. V., et al., 2022). Previous studies have shown the tendency to injure athletes in contact sports such as basketball (Qëndro et al., 2024). Young basketball players are influenced by the effects of continuous mechanical stress, rapid biological growth, sports overload, and neuromuscular development, which increases the risk of overuse injury (Zoellner, A., & Whatman, C., 2025) while limiting sports activities and functional limitations. In order to determine the impact of sports overuse injury, the sports population uses a measuring tool called the OSTRC Overuse Injury Questionnaire (Owoeye, O.B.A. et al., 2018). This is a standard questionnaire from the Oslo Sports Trauma Research Centre (Weiss, K. J., et al., 2017) to help identify injuries, especially in young athletes with symptoms. In many cases, in young athletes, not only are symptom monitoring, neuromuscular control, and dynamic stability evaluated, but also functional capacity. KOS-ADLS sports activity scale assesses the functional capacity of young basketball players in relation to the specific requirements of basketball (Nyland, J. et al. 2025). There are many conservative physiotherapeutic interventions to improve the functioning of young basketball players. Mulligan's technique is based on joint mobilization combined with active physiological movements and acts to interact with the physiological kinematics of joint movements and neurophysiological mechanisms of pain (ElMeligie, M. M., et al., 2025; Veizaj, S. S., et al., 2024). Randomized studies to assess the effect of Mulligan's MWM technique, versus Kinesiotaping and placebo, are limited, especially studies that are applied to young basketball players. The lack of evidence from randomized studies also has to do with the assessment of

the injury rate in young athletes, on the one hand, and the assessment of the level of activity and sports functionality, on the other. Although a good part of the research is focused on rehabilitation through conservative management of sports injury in young basketball players (Sos-Tirado, M. et al., 2024). This randomized study aimed to evaluate the effect of the Mulligan MWM technique, the Kinesiotaping technique, and a placebo intervention in young U16-U20 basketball players on reducing symptoms of knee injuries and improving functionality and sports levels. This study hypothesized that the Mulligan group would have a more significant improvement in the KOS-SAS and OSRTC scores.

### **Objectives**

The primary objective is to compare the effect of Mulligan, Kinesiotaping and Placebo in improving the functionality and scale of sports activity in U16-U20 basketball players.

The secondary objective is to evaluate the effect of the Mulligan, Kinesiotaping, and Placebo intervention in decreasing the level of overuse injuries in U16-U20 basketball players.

The third objective is whether each of the techniques, Mulligan, Kinesiotaping, and Placebo, has an impact on the relationship between decreasing the rate of OSTRC overuse injury and increasing the ADLS functional scale and SAS sports activity scale in U16-U20 basketball players.

### **Study Design**

This study was designed as a parallel group randomized controlled clinical trial with three intervention arms: Mulligan Mobilization with movement MWM, Kinesiotaping, and Placebo with repeated measurements at baseline, 1 hour, and 2 weeks after treatment.

### **Participants**

#### ***Inclusion Criteria:***

- ✓ Male and female genders
- ✓ Have a minimum of 2 years of sports experience
- ✓ Presence of knee injury
- ✓ Active participation in sport.

#### ***Exclusion Criteria:***

- ✓ Knee surgery
- ✓ Knee instability
- ✓ Neurological disorders
- ✓ Not approve of the application of the Mulligan method

### **Recruitment Method**

The basketball players were recruited from local sports clubs through referrals and collaborations from the club coaches.

## Interventions / Procedures

### *Mulligan Group Experimental*

For all participants who applied, regardless of the type of knee injury, Mulligan Mobilization with movement MWM in the squat position was used manually to maintain the homogeneity of the treatment. The intervention included tibial glide by the therapist while the basketball players actively performed the mobilization without pain. The athletes underwent the technique 2 sessions per week for 2 weeks. Each session lasted 5 min, and the technique was applied by a Physiotherapist who had the Mulligan technique certificate.

### *Kinesiotaping Active Comparator Group*

Kinesiotaping was also used in a model regardless of the injury of athletes. Initially, the measurement was made from the medial and lateral condyles of the knee by placing a y-taping from the tibial tuberosity towards the femoral condyles, and another taping was placed horizontally over the patella. It was applied 2 times a week for 2 weeks for 5 minutes

### *Placebo Comparator Group*

In this group, participants received a sham intervention to mimic the treatment without therapeutic effect twice a week for 2 weeks, for 5 minutes.

## Outcome Measures

Primary Outcomes:KOS-ADLS: The Activities of Daily Living Scale (ADLS) subscale of the Knee Outcome Survey evaluates symptoms and functional limitations during daily activities. Scores range from 0 to 100, with higher scores indicating better function.

The Sports Activity Scale (SAS) subscale of the Knee Outcome Survey evaluates knee function during sports and higher-level activities. Scores range from 0 to 100, with higher scores indicating better sports-related function.

Secondary outcomes The OSTRC Overuse Injury Questionnaire is a validated self-report tool used to monitor the severity and impact of overuse-related musculoskeletal problems. It assesses the consequences of knee-related problems on sports participation, training volume, performance, and symptom severity. Each question is scored on a graded response scale, and a severity score is calculated, with higher scores indicating greater symptom burden and functional impairment.

## Timeline / Schedule of Assessments

Outcome /Assessment	Baseline treatment	pre	1 hour post treatment	2 weeks post treatment
KOS-ADLS ; ADLS	*		*	*
SAS	*		*	*
OSTRC	*		*	*`

## Sample Size & Justification

The simple size (N=60) was determined based on the available number of eligible participants during the period of study. A post-hoc power analysis was conducted for the

ADLS outcome using mixed ANOVA. The time  $\times$  group interaction yielded  $\eta^2p = 0.816$  (Cohen's  $f = 2.11$ ), indicating a very high statistical power (1.0) for detecting the observed effect.

### **Ethics and Regulatory Approvals**

Ethics Committee Approval. This study has been reviewed and approved by the University of Sports of Tirana. Ethics Committee for scientific research.

Approval Reference Number: Prot. Nr. 3736/2

Approval Date: 10/12/2024.

### **Confidentiality Measures**

All participant data will be treated with strict confidentiality. Personal identifiers have been replaced with coded identification numbers. Data are stored and are only accessible by the study researchers. Any publication or presentation of study results will report only aggregated data, ensuring that individual participants cannot be identified.

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