

# Frontal Plane Neurokinematical Mechanisms of Knee Joint and Pelvis Stabilization During Unilateral Vertical Jump

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## Abstract

**Statement of the Problem:** In our experiment, we assumed that the m. gluteus medius (GM) muscle as a stabilizer of the knee joint is related to the extent of knee valgus during unilateral jump. We also assumed that the m. erector spinae (ES) and m. quadratus lumborum (QL) muscles are related to the scale of the pelvis frontal plane tilt during unilateral vertical jump.

**Methodology & Theoretical Orientation:** Twenty-three healthy males performed maximal hip abduction and trunk lateral flexion for recording GM, ES and QL EMG activity. During unilateral jumps, we calculated the propulsive mechanical impulse using the force-time curves recorded with force plate. Through the unilateral jump, with a motion tracking system, we measured the degree of the orientation angles of the thigh and the pelvis in the frontal plane. EMG was recorded during the jumps and all values were normalized to those obtained during either hip abduction or trunk lateral flexion.

## Findings

Through the jumps we received the following normalized EMG outcomes: ES: 311%, QL: 292%, GM: 142%. There was no correlation among propulsive impulse and any EMG values. However, we found negative correlation between GM activity during unilateral jump and the extent of the knee valgus. QL and ES activities were not correlated with the magnitude of hip tilt.

## Conclusion & Significance

Our results show that during unilateral jump the activation of all of the muscles are prominent. Jumping ability is independent from the activity of the stabilizer muscles, but the activity of GM highly influences knee valgus, therefore strengthening the GM could play a role in the reduction of knee injuries.

## Article Information

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