

ORIGINAL RESEARCH

NOT ALL SINGLE LEG SQUATS ARE EQUAL:
A BIOMECHANICAL COMPARISON OF THREE
VARIATIONSAnne Khuu¹Eric Foch, PhD²Cara L. Lewis, PT, PhD¹

ABSTRACT

Background: The single leg squat (SLS) is a functional task used by practitioners to evaluate and treat multiple pathologies of the lower extremity. Variations of the SLS may have different neuromuscular and biomechanical demands. The effect of altering the non-stance leg position during the SLS on trunk, pelvic, and lower extremity mechanics has not been reported.

Purpose: The purpose of this study was to compare trunk, pelvic, hip, knee, and ankle kinematics and hip, knee, and ankle kinetics of three variations of the SLS using different non-stance leg positions: SLS-Front, SLS-Middle, and SLS-Back.

Methods: Sixteen healthy women performed the three SLS tasks while data were collected using a motion capture system and force plates. Joint mechanics in the sagittal, frontal, and transverse planes were compared for the SLS tasks using a separate repeated-measures analysis of variance (ANOVA) for each variable at two analysis points: peak knee flexion (PKF) and 60° of knee flexion (60KF).

Results: Different non-stance leg positions during the SLS resulted in distinct movement patterns and moments at the trunk, pelvis, and lower extremity. At PKF, SLS-Back exhibited the greatest kinematic differences ($p < 0.05$) from SLS-Front and SLS-Middle with greater ipsilateral trunk flexion, pelvic anterior tilt and drop, hip flexion and adduction, and external rotation as well as less knee flexion and abduction. SLS-Back also showed the greatest kinetic differences ($p < 0.05$) from SLS-Front and SLS-Middle with greater hip external rotator moment and knee extensor moment as well as less hip extensor moment and knee adductor moment at PKF. At 60KF, the findings were similar except at the knee.

Conclusion: The mechanics of the trunk, pelvis, and lower extremity during the SLS were affected by the position of the non-stance leg in healthy females. Practitioners can use these findings to distinguish between SLS variations and to select the appropriate SLS for assessment and rehabilitation.

Level of Evidence: 3

Key Words: Females, kinematics, kinetics, lower extremity, single limb squat

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