

Performance on the Timed Single-Leg Step-Down Test Is Correlated with Hip and Knee Biomechanics Measured by 3D Markerless Motion Capture:

Timed SLSD performance reflects frontal/transverse plane knee–hip control.

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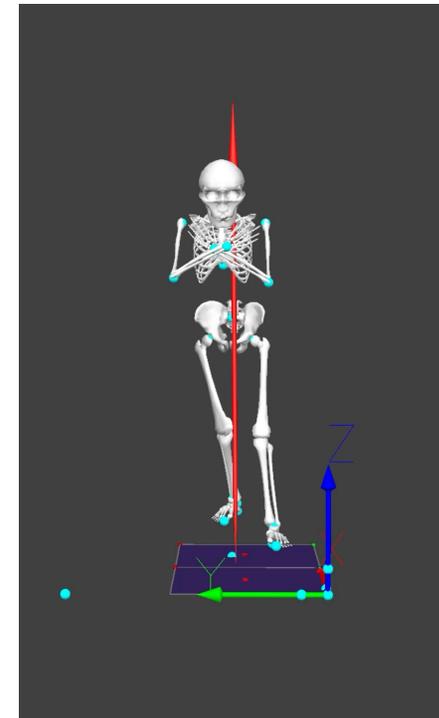
Disclosures

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Why Single-Leg Step-Down, and what we don't know?

- The timed SLSD is already used because it is quick, inexpensive, and unilateral.
- What is less clear is whether “more reps” reflects better frontal- and transverse-plane control rather than simple pacing or endurance.
- **Clinical Question:** Does better timed SLSD performance track hip/knee mechanics that matter to screening and rehabilitation?
- **Aim:** Correlate 60 second SLSD performance with frontal/transverse plane hip and knee kinematics (markerless 3D motion capture).



Does better SLSD performance reflect better hip & knee control?



Design & Procedures

Cohort

n=20 healthy high school athletes (ages 14-18); no recent LE injury (15 male, 5 female).

Task

60-second timed SLSD; count quality repetitions per standardized criteria (pelvis level, controlled knee alignment, full step-down, etc.) = SLSD Score

Motion Capture

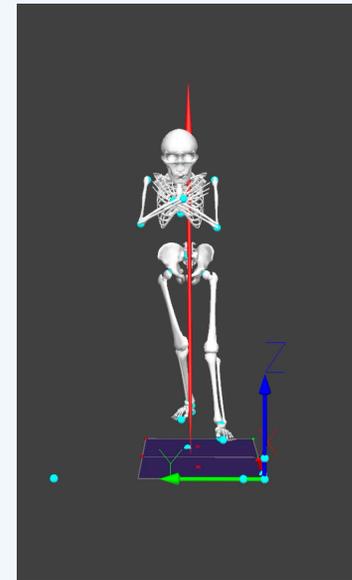
Markerless 3D; kinematics exported via Theia3D® + Visual3D®.

Outcomes

Thorax side-bend, pelvic obliquity, hip rotation, knee angulation.

Statistics

Pearson + Spearman correlations between SLSD score and kinematics.



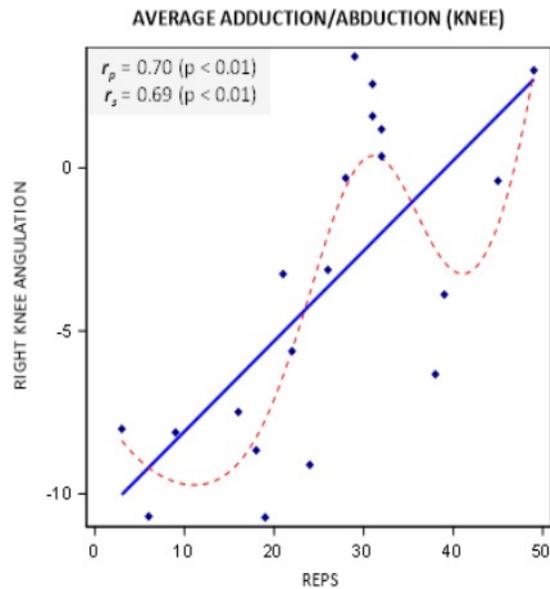
Practical testing setup

7-inch box
1-inch scale
Valid heel tap <10% body weight
Return to full knee extension

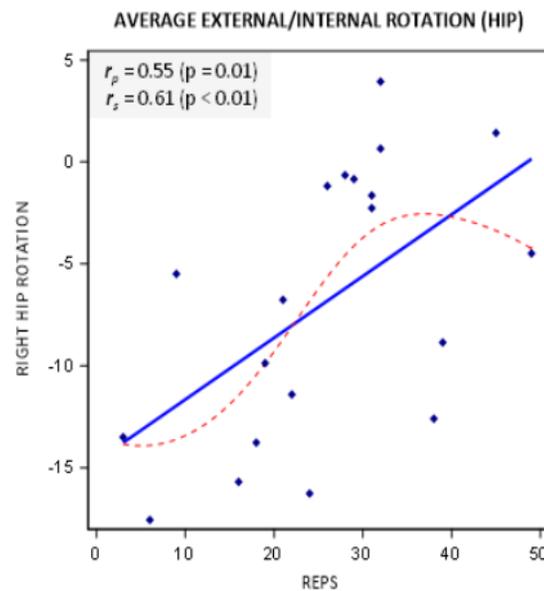


Main Findings

More valid timed SLSD reps were associated with less right knee abduction and less right hip internal rotation.



Pearson $r = 0.70$
Spearman $\rho = 0.69$
Both $p < 0.01$



Pearson $r = 0.55$
Spearman $\rho = 0.61$
 $p = 0.01 / <0.01$

**No significant association:
thorax side bend or pelvic obliquity*



Clinical Takeaways

- Better timed SLSD performance may reflect better frontal-plane knee control and better transverse-plane hip control, not just more endurance.
- In a busy clinic, timed SLSD can be a useful adjunct screen when you want one low-cost unilateral task that blends capacity and movement quality.
- The most clinically meaningful read is probably reps + how the knee and hip behave while the reps are completed.

1. **Count valid reps**
60-second timed
SLSD
Standardized
validity criteria

2. **Watch frontal plane**
Look for
excessive knee
abduction /
dynamic valgus

3. **Watch hip control**
Look for
excessive internal
rotation or poor
proximal control

Practical Interpretation

If an athlete has low reps or obvious loss of knee/hip control, that is the patient who most likely deserves a closer neuromuscular and rehabilitation-focused workup.



Clinical Relevance

What this test may tell you

- A quick snapshot of single-limb control under repeated loading
- A practical way to blend task capacity with visible movement quality
- A low-cost adjunct when formal motion analysis is unavailable
- A potential rehab follow-up task to track change over time

What this test does NOT prove

- It does not establish injury prediction or causation
- It comes from a small, male-predominant, cross-sectional cohort
- The strongest findings were right-sided in a mostly right-dominant sample
- Distal mechanics were not measured, and pelvic/hip markerless estimates require caution



Bottom Line for Practice

- **Timed SLSD performance appears to reflect more than reps alone; in this cohort, higher scores tracked less right knee abduction and less right hip internal rotation.**
- Clinically, the test may be most valuable when you interpret repetition count together with visible knee and hip mechanics during the task.
- Use the timed SLSD as an accessible adjunct for screening, rehabilitation progression, and return-to-sport follow-up; avoid claims that it independently predicts injury risk.

What's next?

Larger, sex-balanced cohorts and prospective follow-up to test whether SLSD thresholds relate to injury risk or respond to targeted neuromuscular interventions.



Thank you



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