

Sit-to-stand analysis report

Subject -	Session squats	Trial STS	# Repetitions 5
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Sit-to-stand metrics

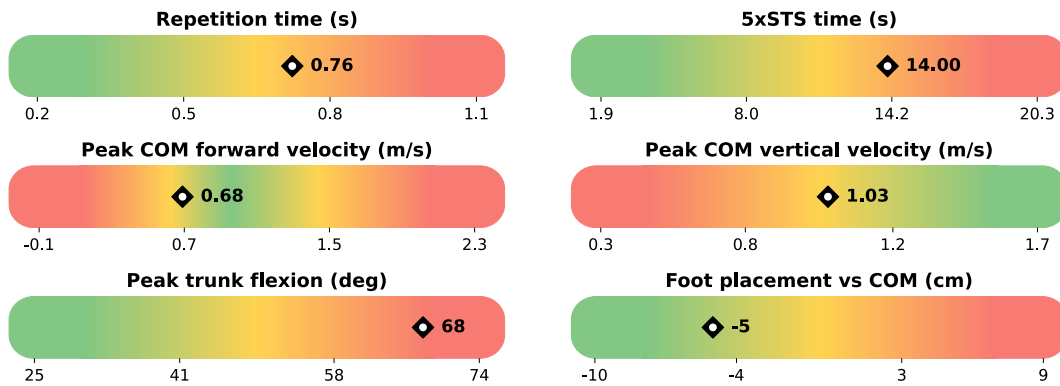


Figure 1: Values are averaged over 5 repetitions (except for 5xSTS time). Colors indicate how results compare to normative data from an average population. For directional metrics, the distribution is split into the top 25% (green), middle 50% (yellow), and bottom 25% (red). For centered metrics, green represents the middle 40% (P30-P70), red marks the outer 10% extremes, and yellow is the transition zone between green and red.

Per-repetition metrics

Metric	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Repetition time (s)	0.70	0.73	0.77	0.75	0.85
Peak COM forward velocity (m/s)	0.67	0.64	0.73	0.67	0.71
Peak COM vertical velocity (m/s)	0.91	1.12	1.05	1.00	1.04
Peak trunk flexion (deg)	70.3	67.5	68.7	66.5	66.2
Foot placement vs COM (cm)	-7	-6	-5	-5	-5

Description of the metrics

- **TODO Repetition time** is the duration between seat-off and the completion of the sit-to-stand. Lower time generally indicates greater efficiency.
- **5xSTS time** is the duration from seat-off of the first repetition to the completion of the fifth and final repetition. Lower time generally indicates greater efficiency.
- **Peak COM forward velocity** is the maximum forward velocity of the center of mass (COM). A balanced peak velocity is desirable to complete the task efficiently but controlled to avoid compromising stability.
- **Peak COM vertical velocity** is the maximum upward velocity of the center of mass (COM). Higher peak velocity generally reflects a more efficient and dynamic transition from sitting to standing.
- **Peak trunk flexion** is the maximum angle of the trunk in the sagittal plane. Higher trunk flexion generally indicates a hip-trunk rising strategy, whereas lower trunk flexion indicates a knee-dominant strategy.
- **Foot placement vs COM** is the distance at seat-off between the line connecting the feet and the projection of the center of mass onto the ground. Positive values indicate the feet are in front of the center of mass. Lower values indicate a posterior foot placement, which might facilitate momentum transfer from the trunk into the lower extremities to produce the upward movement of the body.

Rising strategy

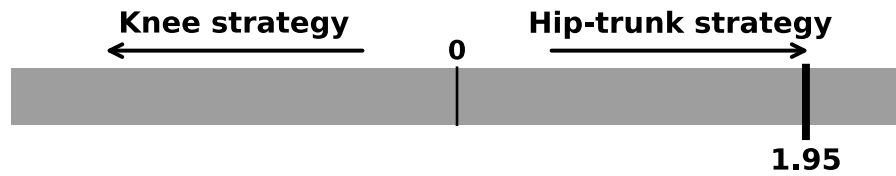


Figure 2: The rising strategy is determined by the z-score of the peak trunk flexion angle, which is calculated based on normative data. The z-score indicates how many standard deviations a given value is from the mean of the reference population. Assuming a continuum of rising strategies, positive values correspond to a hip-trunk rising strategy, whereas negative values correspond to a knee strategy. A hip-trunk strategy involves lower knee extension moments but higher hip and trunk extension moments compared to a knee strategy, resulting in decreased demand on the knee extensors and increased demand on the hip and trunk extensors. It is a rising strategy often used by older adults and is associated with low functional muscle strength. A knee strategy may offer better efficiency, while a hip-trunk strategy could improve stability by positioning the center of mass closer to the base of support.

Joint kinematics

Lower-body and lumbar joint angles

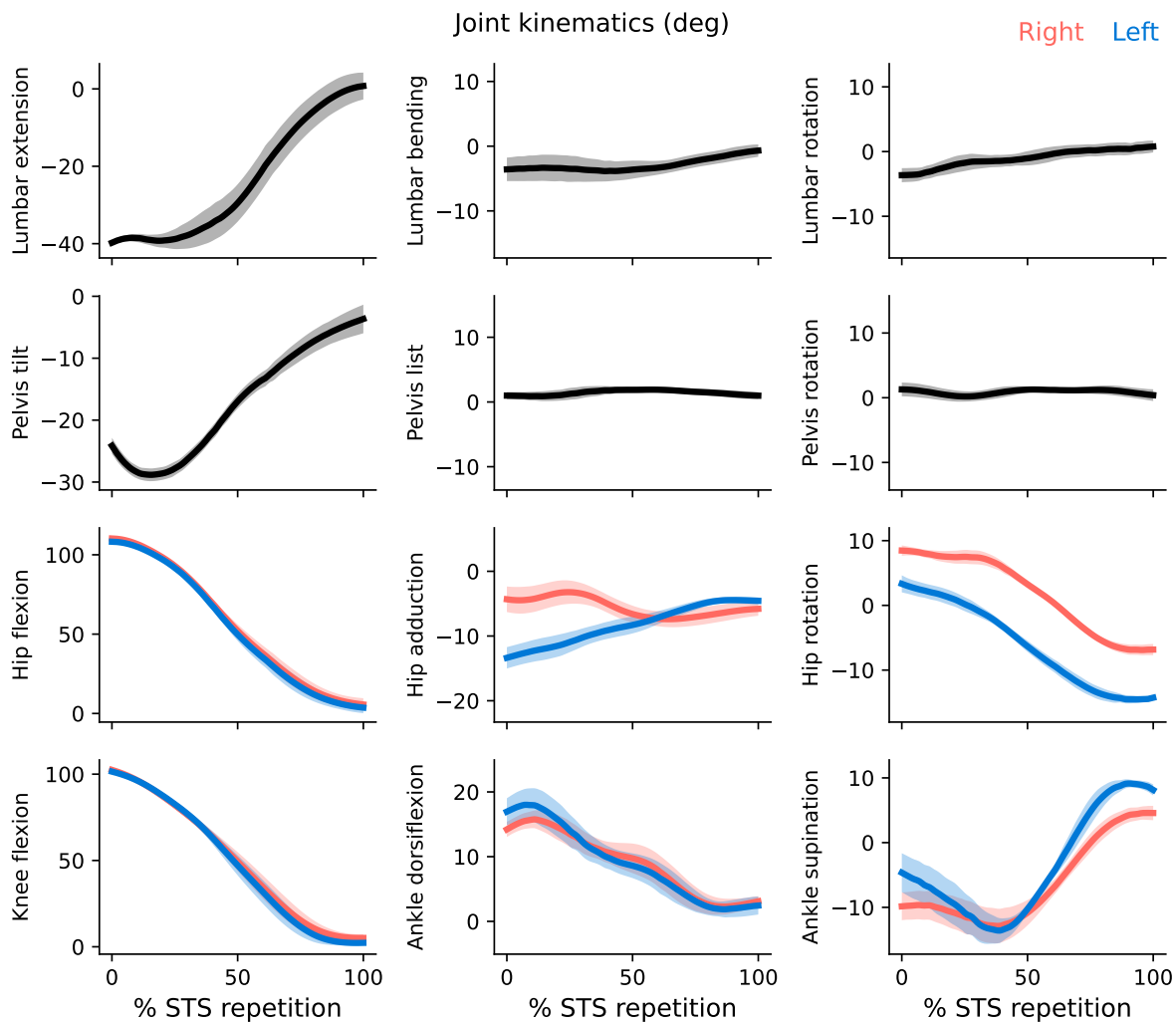


Figure 3: Joint angles (mean \pm standard deviation across 5 repetitions) normalized over the sit-to-stand (STS) repetition.

- Lumbar extension (sagittal plane) is positive when the trunk extends posteriorly.
- Lumbar bending (frontal plane) is positive when the trunk bends toward the right side.
- Lumbar rotation (transverse plane) is positive when the trunk rotates toward the left side.
- Pelvis tilt is positive when the pelvis tilts posteriorly.
- Pelvis list is positive when the left side of the pelvis moves upward.
- Pelvis rotation (transverse plane) is positive when the right side of the pelvis rotates anteriorly.
- Hip rotation is positive when the femur rotates medially (internal rotation).

Pelvis translations

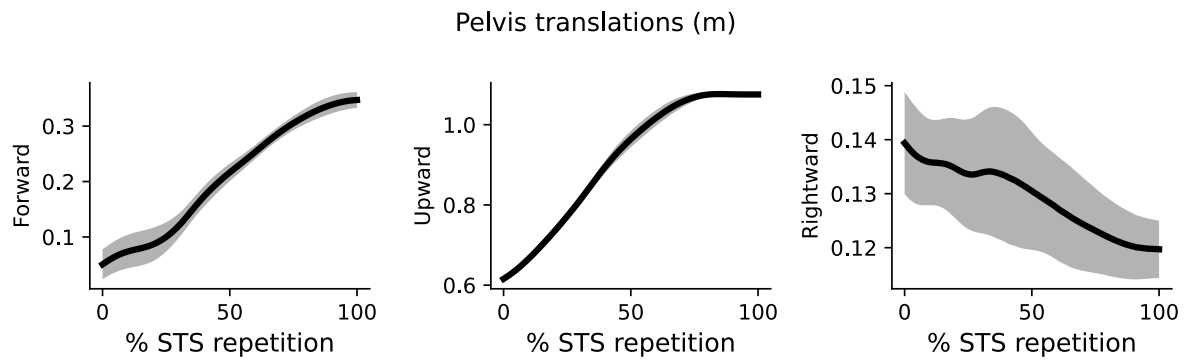


Figure 4: Pelvis translations (mean \pm standard deviation across 5 repetitions) normalized over the sit-to-stand (STS) repetition.