

Countermovement jump analysis report

Subject -	Session 5f607aad	Trial cmj3_double	Type Double leg (3 reps)
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Countermovement jump metrics

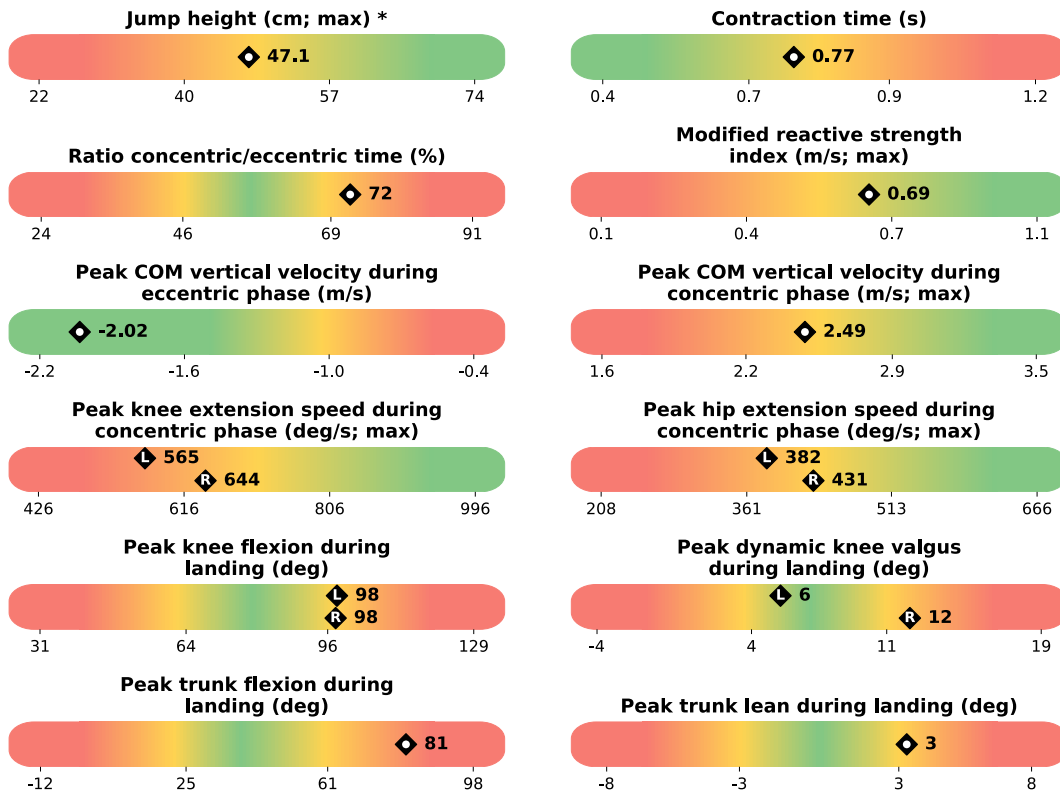


Figure 1: Colors indicate how results compare to normative data from healthy adult populations, comprising both males and females. For directional metrics (where higher or lower is universally better), the top 25% is green, the middle 50% yellow, and the bottom 25% red. For centered metrics (where both extremes are unfavorable), green represents the middle 40% (30th-70th percentile), red the outer extremes (below the 10th or above the 90th percentile), and yellow the transition zones in between. If multiple repetitions are performed, the reported value is the average, except when a specific value is indicated in brackets. *Zones boundaries are dependent on the subject's leg length.

Countermovement jump phases and events

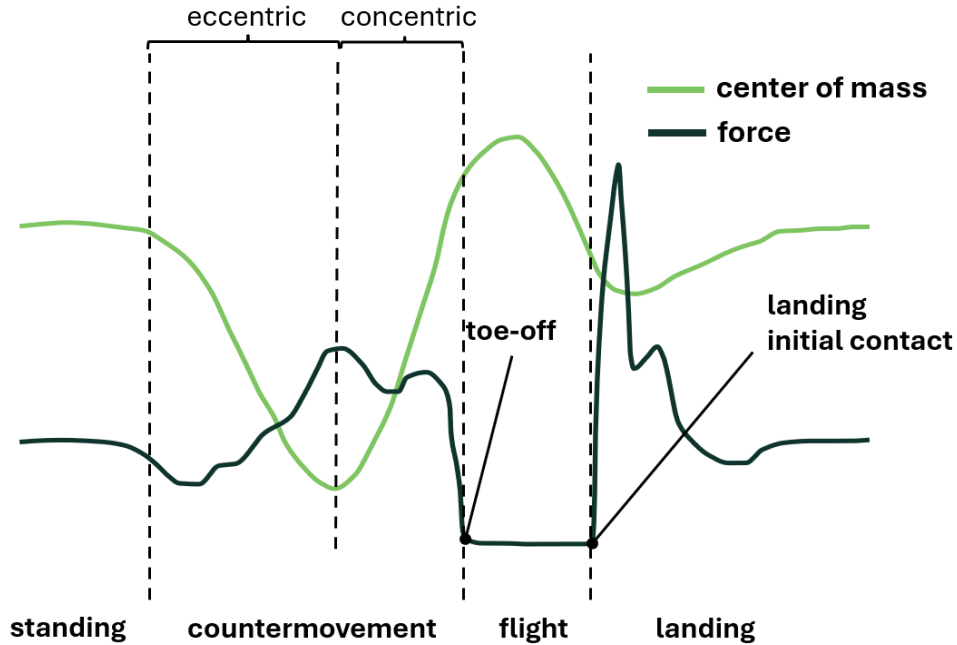


Figure 2: Phases and events of the countermovement jump defined using center-of-mass vertical position and vertical force. A standing phase is followed by the countermovement phase, which includes an eccentric (downward motion) and concentric (upward motion) portion. The countermovement ends at toe-off, initiating the flight phase, which transitions to landing at initial contact. The mean absolute error (MAE) of our detection algorithm is 12 ms for toe-off and 10 ms for landing contact.

Per-jump metrics

Metric	Jump 1		Jump 2		Jump 3	
	L	R	L	R	L	R
Jump height (cm)	47.1		44.4		41.8	
Contraction time (s)	0.96		0.74		0.61	
Eccentric time (s)	0.68		0.42		0.31	
Concentric time (s)	0.28		0.32		0.30	
Ratio concentric/eccentric time (%)	41		78		97	
Modified reactive strength index (m/s)	0.49		0.60		0.69	
Peak COM vertical velocity during eccentric phase (m/s)	-0.64		-2.82		-2.58	
Peak COM vertical velocity during concentric phase (m/s)	2.49		2.39		2.30	
Peak knee extension speed during concentric phase (deg/s)	565	625	522	644	522	593
Peak hip extension speed during concentric phase (deg/s)	376	416	370	431	382	419
Peak knee flexion during landing (deg)	102.2	104.4	96.2	95.4	96.1	93.7
Peak dynamic knee valgus during landing (deg)	5.2	9.5	4.1	12.4	7.2	14.8
Peak hip flexion during landing (deg)	105.3	104.9	91.9	90.4	88.9	86.0
Peak trunk flexion during landing (deg)		89.6		79.0		74.2
Peak trunk lean during landing (deg)		3.5		2.9		3.5

Description of the metrics

Performance metrics

- **Jump height** is the vertical distance between the center of mass in a standing position and its highest point during the flight phase. Higher values indicate better performance.
- **Contraction time** is the sum of eccentric and concentric phase durations.
- **Eccentric time** is the duration of the eccentric countermovement phase.
- **Concentric time** is the duration of the concentric countermovement phase.
- **Ratio concentric/eccentric time** is the ratio of the duration of the concentric phase to the duration of the eccentric phase. Lower values are generally associated with more efficient utilization of the stretch-shortening cycle (SSC).
- **Modified reactive strength index (RSI)** is the ratio of jump height to contraction time. A higher RSI reflects the ability to produce explosive movement while minimizing the time required to execute the jump.
- **Peak COM vertical velocity during eccentric phase** is the maximum downward center-of-mass velocity reached during the eccentric phase. More negative values indicate a faster descent, which increases deceleration demands and is typically associated with greater braking capacity and eccentric force production. This metric can also be used to assess CMJ consistency and movement validity.
- **Peak COM vertical velocity during concentric phase** is the maximum upward center-of-mass velocity reached during the concentric phase and reflects overall force generation capacity. Higher values are typically associated with greater jump height.
- **Peak knee extension speed during concentric phase** is indicative of force generation. Higher values are desirable.
- **Peak hip extension speed during concentric phase** is indicative of force generation. Higher values are desirable.

Landing metrics

- **Peak knee flexion during landing** is indicative of coordination during landing. While the landing phase is less critical for performance, a balanced value reflects a trade-off between shock absorption and efficiency.
- **Peak dynamic knee valgus during landing.** A lower value is desirable to reduce injury risk (e.g., iliotibial band and patellofemoral pain syndromes).
- **Peak hip flexion during landing** is indicative of coordination during landing. While the landing phase is less critical for performance, a balanced value reflects a trade-off between shock absorption and efficiency.
- **Peak trunk flexion during landing** is indicative of coordination during landing. While the landing phase is less critical for performance, a balanced value reflects a trade-off between shock absorption and efficiency.
- **Peak trunk lean during landing** is the maximum trunk angle in the frontal plane observed during landing. Greater lean may cause uneven loading across the lower-limb joints.

Joint kinematics

Lower-body and lumbar joint angles

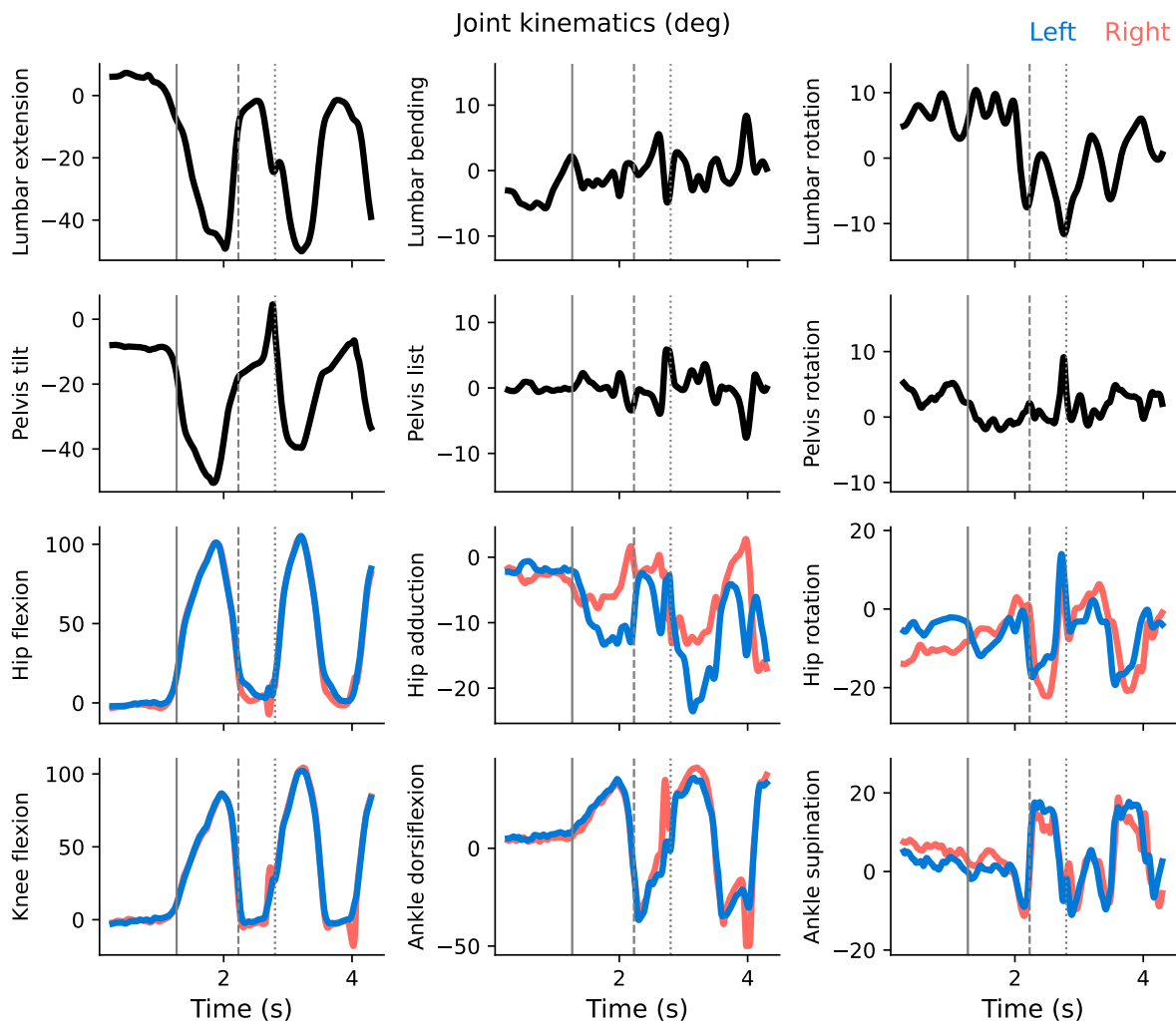


Figure 3: Joint angles of the first jump. Vertical lines indicate the start of the countermovement (solid), toe-off (dashed), and landing contact (dotted).

- 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

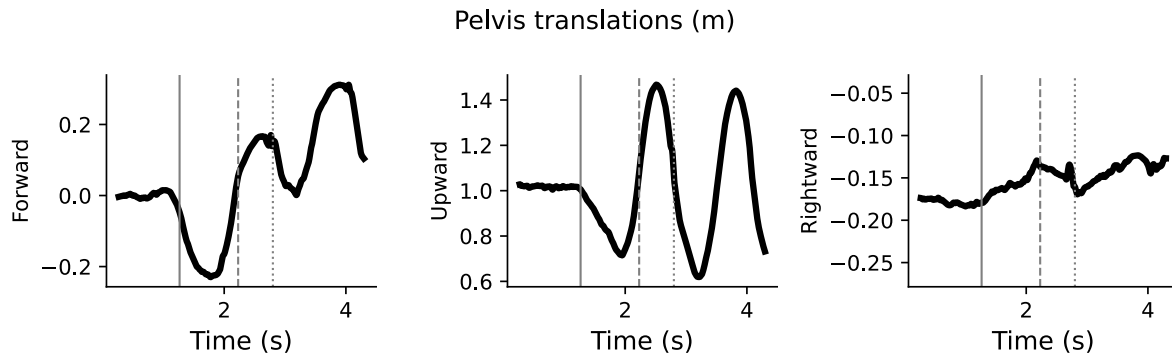


Figure 4: Pelvis translations of the first jump. Vertical lines indicate the start of the counter-movement (solid), toe-off (dashed), and landing contact (dotted).