PERFORMANCE DIFFERENCES ON SINGLE LIMB FUNCTIONAL TESTS IN COLLEGE BASEBALL PLAYERS

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Introduction

In baseball players, repetitive throwing motions often lead to strength and stability imbalances between throwing and non-throwing limbs.

These asymmetries may lead to injury risk and impair performance.

The primary aim of this study was to assess limb symmetry between the throwing and non-throwing limbs using three single-limb functional tests: closed-kinetic chain upper extremity stability test (CKCUEST), upper extremity vertical jump, and lower extremity vertical jump.

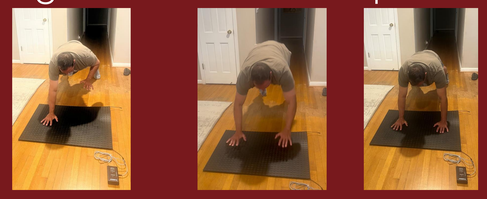
Secondary aims included examining performance differences between pitchers and position players, as well as between players with a history of shoulder or elbow surgery and those without.

Methods

Sixty-eight National Association of Intercollegiate Athletics (NAIA) college baseball players (37 pitchers, 21 with history of shoulder or elbow surgery) volunteered for the study.

Team Lead dynamic warm was performed before testing.

- TESTING: Each assessment included two practice trials and three testing trials, alternating between throwing and non-throwing limbs, with the starting limb selected randomly.
- Single Arm Vertical Jump Test



- Single Arm Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST)

- Single Leg Vertical Jump

- Multiple T-tests were used to analyze differences between limbs, as well as between groups, with a significant level of $p < 0.05$.

Table 1. Differences between throwing and non-throwing limbs

All Athletes (n = 68)			
	Throwing	Non-throwing	*p*
CKCUEST (reps)	25.1 ± 3.55	27.0 ± 3.96	< 0.01*
UEVJ (cm)	8.81 ± 3.43	8.71 ± 3.84	0.58
LEVJ (cm)	21.9 ± 4.14	22.1 ± 4.19	0.57
Pitchers (n= 37) vs Position Players (n = 31)			
	Pitchers	Position	*p*
Throwing CKCUEST (reps)	24.3 ± 3.10	26.0 ± 3.88	0.05
Non-Throwing CKCUEST (reps)	26.4 ± 3.71	27.8 ± 4.19	0.18
CKCUEST limb symmetry (%)	92.7 ± 7.68	94.3 ± 8.00	0.80
Throwing UEVJ (cm)	8.33 ± 3.63	9.42 ± 3.61	0.20
Non-Throwing UEVJ (cm)	9.22 ± 3.38	9.29 ± 4.29	0.26
UEVJ limb symmetry (%)	109.9 ± 41.4	110.0 ± 35.3	0.99
Throwing LEVJ (cm)	21.5 ± 4.85	22.8 ± 3.12	0.42
Non-Throwing LEVJ (cm)	21.4 ± 4.98	22.9 ± 2.87	0.15
LEVJ limb symmetry (%)	101.4 ± 11.4	98.0 ± 6.20	0.13
History of Shoulder or Elbow Surgery vs No History of Surgery			
	Surgery	Non-surgery	*p*
Throwing CKCUEST (reps)	24.5 ± 3.64	25.8 ± 3.34	0.33
Non-Throwing CKCUEST (reps)	26.6 ± 3.98	27.1 ± 3.98	0.62
CKCUEST limb symmetry (%)	92.4 ± 7.36	93.9 ± 8.08	0.46
Throwing UEVJ (cm)	9.19 ± 3.33	8.64 ± 3.51	0.54
Non-Throwing UEVJ (cm)	8.81 ± 3.20	8.56 ± 4.11	0.80
UEVJ limb symmetry (%)	110.5 ± 36.3	109.6 ± 39.7	0.94
Throwing LEVJ (cm)	21.5 ± 3.30	22.1 ± 4.52	0.53
Non-Throwing LEVJ (cm)	21.7 ± 4.88	22.3 ± 3.89	0.62
LEVJ limb symmetry (%)	100.9 ± 13.5	99.4 ± 7.03	0.62

Note: *: significant difference; LSI: Limb symmetry index (Throwing/Non-throwing x 100); CKCUEST: Single arm closed kinetic chain upper extremity stability test; UEVT: Upper extremity vertical jump test; LEVT: Lower extremity vertical jump test; Limb symmetry: ((throwing arm/non-throwing)*100)

Results

Across all baseball players, a significant difference was found with the non-throwing arm performing more repetitions than the throwing arm on the CKCUEST.

When comparing pitchers to position players, results of the throwing arm CKCUEST trended towards significance, with the position players performing more repetitions than the pitchers.

No significant differences were found in any of the three single-limb assessments between athletes with or without a history of shoulder or elbow surgery.

Practical Application

Shoulder stability may be decreased in the throwing shoulder compared to the non-throwing shoulder and this deficit may be greater in pitchers compared to position players when testing college baseball players.

Incorporating closed-kinetic chain shoulder stability exercises into baseball strength and conditioning programs may be necessary to address this asymmetry and improve stability, but more research is warranted.