

TEST-RETEST RELIABILITY OF KNEE ISOKINETIC PEAK TORQUE AND TOTAL WORK IN WOMEN COLLEGIATE FIELD SPORT ATHLETES

Tianyi Lu, Marvin Powell, Chris (Beverly) Green, Margaret T. Jones



PRESENTER: Tianyi Lu

INTRODUCTION

- In isokinetic tests, muscle force varies relative to skeletal leverage efficiency and accommodates factors contributing to force variations in the range of motion. Thus, it is widely considered the gold standard in single joint strength evaluation.
- Limited empirical evidence exists regarding the reliability of isokinetic testing of the knee joint, particularly in women athlete populations.

➤ **PURPOSE:** To investigate the intra-session reliability of an isokinetic dynamometer at the knee joint concentrically and eccentrically in women collegiate field sport athletes.

METHODS

➤ National Collegiate Athletic Association Division I women field sport athletes (n=34, 20 soccer players +14 lacrosse players, mean±standard deviation: age, 19.83±1.12 years; height, 166.57± 5.43cm; body mass, 66.75±5.89kg) participated.

➤ Following a standard warm up protocol, athletes were seated on the dynamometer with the machine's axis of rotation coinciding with the knee's axis. The range of motion was established from 90° (most flexed) to 5° (most extended) knee flexion. Concentric and eccentric measurements of peak knee extensor and flexor torques (PT) and total work (TW) were obtained at angular velocities of 60°/s and 300°/s. Repetitions (rep) consisted of 5 for the 60°/s and 7 for the 300°/s conditions. Within each set, the 2nd and 3rd rep were considered the "test rep" and "re-test rep", respectively.

➤ Data from the dominant leg, defined as the leg utilized to kick a ball, was extracted for further analysis. Intraclass correlation coefficient (ICC) and standard error of measurement (SEM) were calculated for relative and absolute reliabilities, respectively. Smallest real difference (SRD) was also calculated.

KEY FINDINGS

Good to excellent intra-session reliability makes isokinetic testing a reliable method to measure strength at the knee joint in women field sport athletes.



Table 1. Absolute and relative test-retest reliability at 60°/s

Test Measure	ICC (95% confidence interval)	SEM (Nm)	SRD (Nm)
PT – Con Extension	0.956 (0.921-0.978)	6.96	19.29
TW – Con Extension	0.962 (0.922-0.981)	6.29	17.42
PT – Con Flexion	0.974 (0.947-0.987)	2.82	7.82
TW – Con Flexion	0.969 (0.885-0.980)	3.48	9.65
PT – Ecc Extension	0.970 (0.939-0.985)	9.13	25.31
TW Ecc Extension	0.950 (0.908-0.978)	10.61	29.41
PT – Ecc Flexion	0.958 (0.916-0.979)	5.75	15.94
TW – Ecc Flexion	0.955 (0.908-0.978)	5.90	16.35

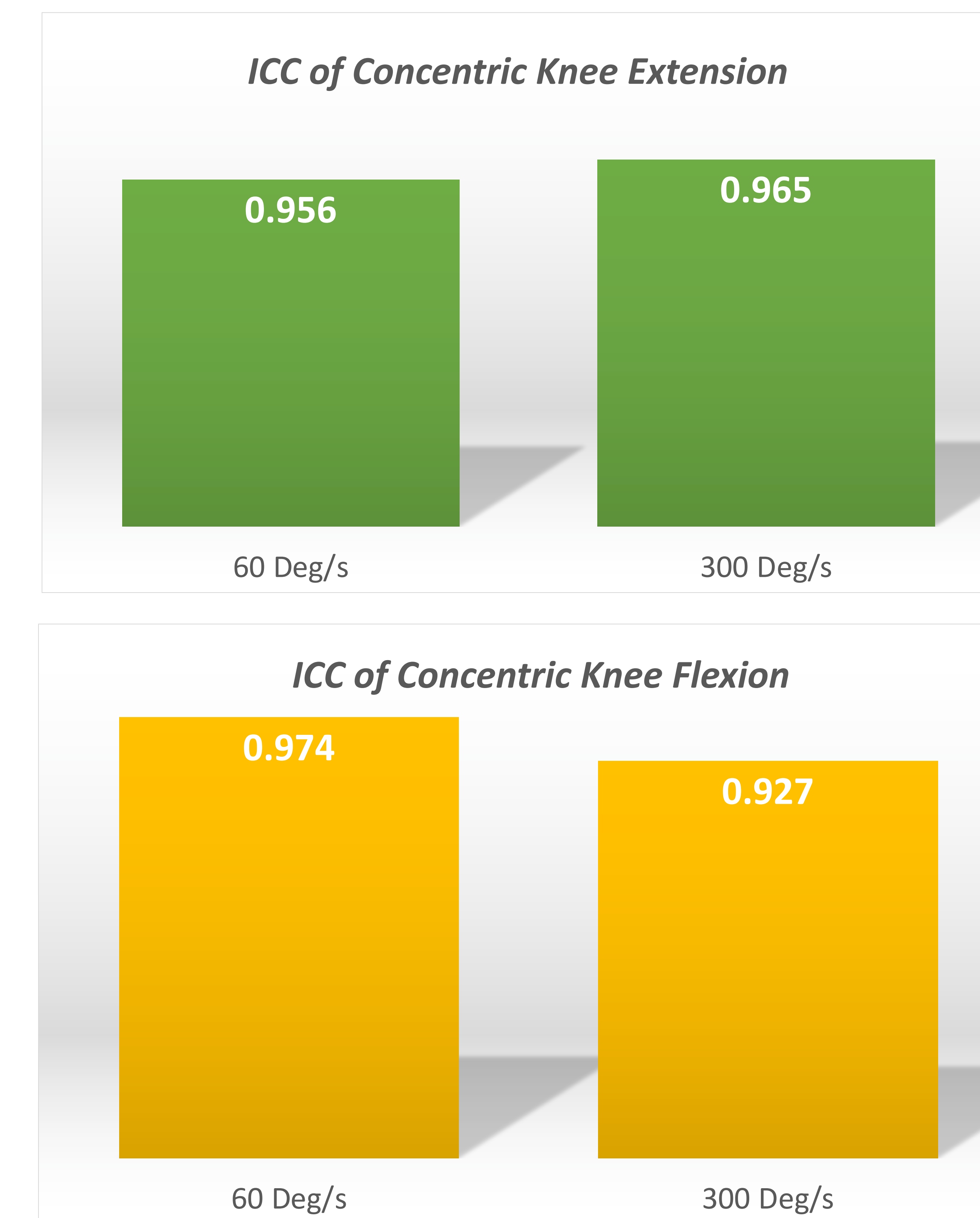
Note: PT = Peak Torque; TW = Total Work; Con = Concentric; Ecc = Eccentric; ICC = Intraclass Correlation Coefficient; SEM = Standard Error of Measurement; SRD = Smallest Real Difference

Table 2. Absolute and relative test-retest reliability at 300°/s

Test Measure	ICC (95% confidence interval)	SEM (Nm)	SRD (Nm)
PT – Con Extension	0.965 (0.929-0.983)	3.57	9.90
TW – Con Extension	0.963 (0.923-0.982)	3.04	8.43
PT – Con Flexion	0.927 (0.852-0.964)	2.90	8.04
TW – Con Flexion	0.893 (0.786-0.947)	2.99	8.29
PT – Ecc Extension	0.967 (0.934-0.983)	9.42	26.11
TW Ecc Extension	0.954 (0.907-0.977)	7.01	19.43
PT – Ecc Flexion	0.955 (0.911-0.978)	4.95	13.72
TW – Ecc Flexion	0.957 (0.914-0.978)	3.73	10.34

Note: PT = Peak Torque; TW = Total Work; Con = Concentric; Ecc = Eccentric; ICC = Intraclass Correlation Coefficient; SEM = Standard Error of Measurement; SRD = Smallest Real Difference

Figure 1. PT ICC Comparison @ 60 vs 300 deg/s



Note: PT = Peak Torque; ICC = Intraclass Correlation Coefficient

RESULTS

- ICCs of PT and TW ranged from 0.893 (300°/s concentric flexion) to 0.974 (60°/s concentric flexion) for all muscle actions (Table 1, 2 & Figure 1).
- The SEM of PT ranged from 2.82 Nm (60°/s concentric flexion) to 9.42 Nm (300°/s eccentric extension). The SEM% was the highest for 300°/s concentric flexion (7.13%) and lowest for 60°/s concentric flexion (3.61%) (Table 1 & 2).
- The PT SRD ranged from 7.82 Nm (60°/s concentric flexion) to 26.11 Nm (300°/s eccentric extension) (Table 1 & 2).

CONCLUSIONS & PRACTICAL APPLICATIONS

- Isokinetic knee extension and flexion exhibited excellent reliability for peak torque and total work concentrically and eccentrically. The only exception was the total work measurement at 300°/s during concentric knee flexion, which may be due to subpar control of the posterior chain.
- The PT SEM of 2.82-9.42 Nm is slightly greater than the previous data in other populations, which might be attributed to a higher strength level and demonstrates a considerable fluctuation of individual performance.
- It is recommended to exercise caution when selecting a high-speed protocol due to a relatively high SEM.

