



COMPARING STRENGTH AND POWER MEASURES BETWEEN DIFFERENT EVENTS IN COLLEGIATE TRACK AND FIELD ATHLETES

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Introduction

- The ability to achieve high levels of force production, as well as being able to produce force rapidly, may be related to track and field (T&F) performance (2).
- Sprinting, hurdle, jump, and multi-event athletes may share similar performance characteristics in their respective events, with sprinting being a common performance metric utilized among varying T&F events (1).
- Other measures of strength and power may contribute to T&F performance. How measures of strength and power compare between different T&F events is less explored.

Purpose

- The purpose of the study was to compare strength and power measures between different events in female collegiate T&F athletes

Methods and Materials

- Participants: Female NCAA Division 1 T&F athletes (Table 1)
- Participants completed the following performance tests: sprint, jump, strength, and power tests: static (30M) and flying (FLY) 30 meter sprints, standing long (LONG) and triple (TRIP) jumps, timed 150 meter run (150), distance in 50 seconds (50SEC), overhead back (OHB) and underhand front (UHF) throws with a 4 kg shot, a hop test for distance (DBL), and absolute and relative 1RMs for clean and squat.
- Participants were divided into subgroups based on T&F event, with the following subgroups used: sprints (SPR, n=11), jumps (JMP, n=13), hurdles (HUR, n=5), and multi-event (MUL, n=6).
- To compare differences in performance tests between events, a one-way ANOVA with Bonferroni adjustments was used ($p < 0.05$). Eta-squared (η^2) and Hedges' g effect sizes were calculated to assess the magnitude of effect.

TABLE 1. Participant demographic data

	N	Height (cm)	Mass (kg)
All	30	168.3 ± 6.8	61.7 ± 7.2
Sprints	7	166.01 ± 6.91	63.44 ± 5.97
Jumps	13	170.47 ± 6.49	61.99 ± 8.59
Hurdles	4	169.55 ± 6.68	63.07 ± 4.09
Multi-events	6	165.31 ± 6.93	61.06 ± 7.85
ANOVA p		0.34	0.76
Results η^2		0.12	0.04

Data are presented as mean ± SD. ANOVA results indicate between-group differences. η^2 = eta squared.

TABLE 2. Jumping and power test performance

	Sprints	Jumps	Hurdles	Multi-events
LONG (m)	2.33 ± 0.33 (n = 11)	2.22 ± 0.13 (n = 12)	2.35 ± 0.18 (n = 5)	2.36 ± 0.04 (n = 4)
TRIP (m)	7.04 ± 0.81 (n = 10)	6.47 ± 0.37 (n = 11)	6.83 ± 0.44 (n = 5)	7.08 ± 0.2 (n = 4)
DBL (m)	11.58 ± 1.13 (n = 10)	11.16 ± 0.78 (n = 13)	11.43 ± 0.98 (n = 5)	11.84 ± 0.30 (n = 5)
OHB (m)	12.43 ± 2.44 (n = 10)	10.27 ± 1.70 (n = 13)	10.37 ± 1.37 (n = 5)	11.74 ± 1.09 (n = 5)
UHF (m)	12.56 ± 1.40 (n = 10)	10.45 ± 1.26 (n = 13)*	10.49 ± 1.33 (n = 5)	11.44 ± 0.59 (n = 5)

Data are presented as mean ± SD. LONG, long jump test; TRIP, triple jump test; DBL, double-double hop test; OHB, overhead back throw; UHF, underhand front throw. * indicates significant difference from the sprints group performance ($p < 0.05$).

TABLE 3. Sprinting test performance

	Sprints	Jumps	Hurdles	Multi-events
30M (sec)	4.04 ± 0.25 (n = 11)	4.31 ± 0.22 (n = 12)*	4.05 ± 0.14 (n = 5)	4.08 ± 0.14 (n = 5)
30FLY (sec)	3.49 ± 0.24 (n = 10)	3.83 ± 0.14 (n = 12)*^	3.51 ± 0.20 (n = 5)	3.57 ± 0.09 (n = 4)
150 (sec)	19.01 ± 1.60 (n = 11)	20.58 ± 0.79 (n = 13)*	19.08 ± 1.05 (n = 5)	19.53 ± 0.89 (n = 6)
50 (m)	331.90 ± 25.56 (n = 10)	310.75 ± 14.47 (n = 12)^	341.40 ± 21.23 (n = 5)	327.80 ± 13.99 (n = 5)

Data are presented as mean ± SD. 30M, 30 meter sprint test; 30FLY, flying 30 meter sprint test; 150, time to sprint 150 meters; 50, distance sprinted in 50 meters. * indicates significant difference from the sprints group performance. ^ indicates significant difference from the hurdles group performance ($p < 0.05$).

TABLE 4. Relative and absolute clean and squat performance

	Sprints	Jumps	Hurdles	Multi-events
CLEAN (kg)	75.22 ± 17.26 (n = 10)	66.32 ± 11.54 (n = 11)	63.64 ± 10.66 (n = 5)	71.02 ± 5.98 (n = 4)
CLEAN _{rel}	1.29 ± 0.25 (n = 6)	1.06 ± 0.12 (n = 11)	1.11 ± 0.15 (n = 4)	1.12 ± 0.17 (n = 4)
SQUAT (kg)	114.55 ± 22.71 (n = 10)	91.53 ± 14.01 (n = 11)*	92.73 ± 14.76 (n = 5)	98.64 ± 4.71 (n = 5)
SQUAT _{rel}	1.81 ± 0.28 (n = 6)	1.47 ± 0.17 (n = 11)*	1.56 ± 0.21 (n = 4)	1.62 ± 0.25 (n = 5)

Data are presented as mean ± SD. CLEAN, clean 1-repetition maximum (1RM); CLEAN_{rel}, clean 1RM relative to body mass; SQUAT, squat 1RM; SQUAT_{rel}, squat 1RM relative to body mass. * indicates significant difference from the sprints group performance ($p < 0.05$).

Results

Jumping and Power Test Performance

- Group differences were found for OHB ($p=0.05$, $\eta^2=0.24$), and UHF ($p=0.002$, $\eta^2=0.39$)
- Post hoc: SPR had a greater UHF compared to JMP (Table 2)

Sprinting Test Performance

- Group differences were found for 150 ($p=0.01$, $\eta^2=0.30$), 50 ($p=0.02$, $\eta^2=0.29$), 30M ($p=0.02$, $\eta^2=0.29$), and 30FLY ($p=0.001$, $\eta^2=0.45$)
- Post hoc: SPR had faster 150, 30M and 30FLY compared to JMP (Table 3)
- HUR had faster 50SEC and 30FLY than JMP (Table 3).

Strength Test Performance

- Group differences were found for SQUAT ($p=0.02$, $\eta^2=0.30$), and SQUAT_{rel} ($p=0.04$, $\eta^2=0.31$)
- Post hoc: SPR had greater SQUAT and SQUAT_{rel} compared to JMP (Table 4).

Conclusion

- Differences between events were observed, with SPR and HUR outperforming JMP in multiple metrics.
- Some metrics that SPR and HUR performed better on were sprinting tests. As SPR and HUR may dedicate more training time to sprinting, this may help to explain these differences.
- Differences were noted in squat strength between SPR and JMP. Lower body strength measures have been identified as positively associated with both sprinting and jumping performance (3).
- As squat 1RM was lower in JMP, this could identify an area for improvement to coaches. However, limited sample size and homogeneity of participants may have contributed to these findings.

Practical Application

- Differences in strength and power performance were noted between some events.
- As some assessments may be more event-specific, understanding performance differences between T&F events may be relevant to coaches. Identifying areas for improvement may inform program design choices.

References

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