STRETCH SHORTENING CYCLE CATEGORY FROM DROP JUMP IS NOT INDICATIVE OF SPRINT PERFORMANCE ACROSS FOOTBALL, BASKETBALL, AND TRACK COLLEGIATE ATHLETES

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INTRODUCTION

- The stretch shortening cycle (SSC) is a countermovement action with a spring-like mechanism and three distinct phases that enhances athletic performance in explosive movements
- An athlete performing a drop jump (DJ) on force plates can be categorized with an SSC category of POOR, MODERATE, and GOOD. Figure 1 shows the criteria for categorization.
- Perfect spring-like behavior produces a Pearson correlation between vertical force and vertical displacement of -1.0.
- When it deviates to >-0.8, it is common to see an impact peak wherein the peak force occurs in the first 20% of ground contact time, suggesting an increased dissipation of energy into passive tissues.
- While individuals can be classified into the SSC category from the drop jump, it is unclear if this translates into differences in sprint performance

PURPOSE

- To determine differences in 30-meter sprint completion times between drop jump SSC categorizations

METHODS

- Sixty-three collegiate athletes participating in football (FB, N=31), basketball (BB, N=10), or track (TR, N=22) had performance data collected during preseason, over two sessions.
- During the first session, all athletes performed DJ from a bench positioned 45.72 cm above two force plates sampling at 1000 Hz.
- DJ performance was then used to determine the spring-like correlation and registered an impact peak. Each athlete performed at least two trials of the DJ with the best trial used for analyses. (See Figure 1).
- Sprint times were captured in an ensuing session using timing gates to capture times at the 5-, 10-, 15-, 20-, 25-, and 30-meter marks. (See Figure 2).

Table 1 - Mean ± Standard Deviation of sprint times in seconds and comparison between groups

	x5m	x10m	x15m	x20m	x25m	x30m
POOR	0.0995 ±.078	1.756 ± .085	2.410 ± .121	3.030 ± .162	3.628 ± .204	4.205 ± .236
MODERATE	1.031 ± .070	1.771 ± .095	2.423 ± .132	3.033 ± .174	3.627 ± .221	4.200 ± .296
GOOD	1.010 ± .085	1.771 ± .096	2.428 ± .140	3.047 ± .175	3.645 ± .218	4.234 ± .224
Kruskal Wallis H	2.909	0.443	0.316	0.095	0.141	0.335
P value	0.234	0.801	0.854	0.954	0.932	0.846

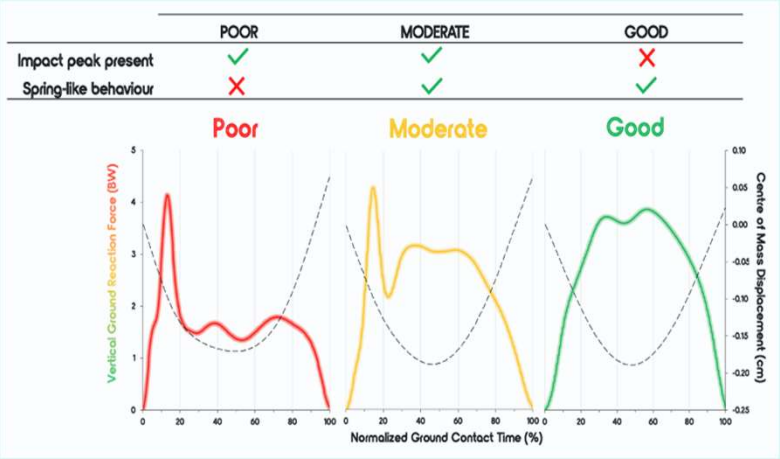

Figure 1 – Impact peak force-time curves from Drop Jump

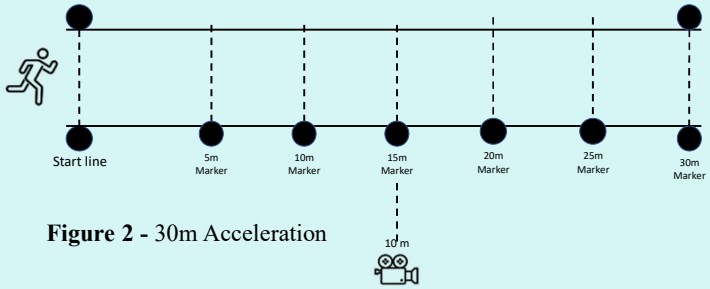

Figure 2 - 30m Acceleration

STATISTICAL ANALYSIS

- A Kruskal-Wallis test was used to determine differences in sprint times between the three SSC categories.
- Significance was set to an alpha level of $p<0.05$.

RESULTS

- Analysis of the DJ showed that 24 athletes were SSC categorized as POOR (FB = 12, BB = 6, TR = 6), 20 categorized as MODERATE (FB = 8, BB = 1, TR = 11), and 19 categorized as GOOD (FB = 11, BB = 3, TR = 5).
- Mean sprint times in seconds for 5m meter intervals are summarized in Table 1.
- Kruskal-Wallis analysis of the sprint times between groups showed no significant differences at any of the timing intervals ($p_{5m} = 0.234$, $p_{10m} = 0.801$, $p_{15m} = 0.854$, $p_{20m} = 0.954$, $p_{25m} = 0.932$, $p_{30m} = 0.846$) (See Table 1).

CONCLUSION

- Drop jump SSC categorization does not result in any differences in performance in 30-meter sprints.

PRACTICAL APPLICATIONS

- While both DJ and sprint performance are valid metrics of SSC oriented assessment, DJ derived SSC categorization does not appear to translate to outcomes in sprint performance.

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REFERENCES

Pedley DJ. Drop jumps - measure these things, by Dr. Jason Pedley. Hawkin Dynamics. June 6, 2024. Accessed June 13, 2024. https://www.hawkindynamics.com/blog/drop-jumps-what-to-measure.