

# LONGITUDINAL CHANGES IN CORRELATION OF DROP JUMP AND VERTICAL JUMP PERFORMANCE WITH SPRINT TIMES

<sup>1</sup>Ashley H. Marschall, <sup>1</sup>Matthew P. Gonzalez, MS, CSCS,\*D, <sup>4</sup>Martin Dietze-Hermosa, PhD, CSCS\*D, <sup>2,3</sup>Samuel Montalvo, PhD, CSCS\*D & <sup>1</sup>Sandor Dorgo, PhD, CSCS\*D, FNCSA



<sup>1</sup>The University of Texas at San Antonio, San Antonio TX.

<sup>2</sup>Division of Cardiovascular Medicine, Stanford University, CA

<sup>3</sup>Wu Tsai Human Performance Alliance, Stanford Medicine, Stanford University, CA.

<sup>3</sup>Brigham Young University – Idaho, Rexburg, ID

## INTRODUCTION

- Track and field athletes train year-round in jumps and sprints to improve their overall performance.
- Previous studies have shown correlation between vertical and drop jump with sprint times, but studies have not observed how such correlations may change over time.

## PURPOSE

- To compare the year-long changes of sprints, drop jump and vertical jump performance of track and field athletes, and to examine how these jump performances correlate with the changes in sprint performance.

## METHODS

- Eleven NCAA Division I track athletes (males = 3 females = 8) participated in this study.
- Each athlete completed trials of 30-meter sprints, vertical jump, and drop jump during their pre-season in 2023, and then again in 2024.
- The variables that were analyzed for the sprint trial were 30-meter split times measured every 5 meters. For the vertical and drop jump, the jump height (cm), modified reactive strength index and propulsive impulse were used for analysis.
- The best trial was analyzed for results. Spearman rank correlations were conducted for each year individually. The T test was also used to analyze the sprint split times from 2023 to 2024. These correlations examined the associations between each of the vertical jump and drop jump measures with each of the sprint split times. Significance was set at  $p < 0.05$ .

## RESULTS

- There was a significant difference between the 30m time trials between the two years. During the 5m, 10m, 15m split times, the athletes recorded slower times in 2024 than 2023. However, after the full 30m sprint, the athletes finished faster in 2024. (See figure 1)
- In 2023, there were no significant correlations for any jump measure.
- In 2024, there were significant differences in the correlation of the vertical jump height for all splits as well as the vertical jump RSI<sub>mod</sub> during all splits excluding the 25m split. (See Table 1)
- The drop jump only had a significant correlation of the propulsive impulse during the latter half of the sprint: the 15m, 20m, 25m, and 30m split times.

## CONCLUSION

- Although the athletes were slower in the first 15m of the 30m sprint, they did improve in their overall 30m sprint time.
- The vertical jump showed correlation during both the first and later stages of the sprint, but the drop jump showed only significant correlation during the later stages.
- This could mean that performance of the propulsive impulse of the drop jump could impact the sprint times during the last 15m of a 30m sprint.

## PRACTICAL APPLICATIONS

- By identifying where athletes can improve, coaches can then develop training plans to work on vertical and drop jump exercises to advance explosiveness, sprint takeoff, and acceleration if needed.

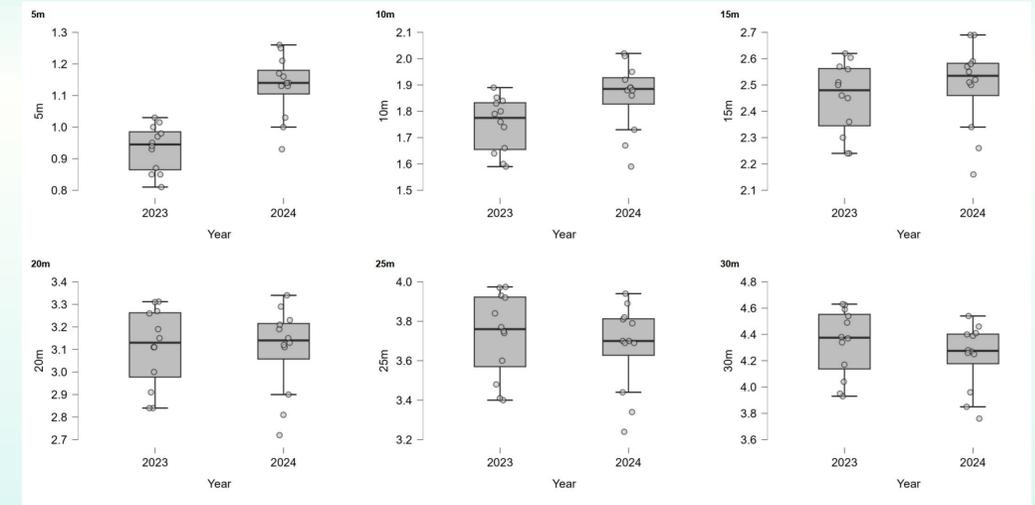


Figure 1. Box plots of 5m split times of a 30m run in 2023 and 2024

Table 1. Illustrates associations between sprint and jump measures across 2023 and 2024

	2023 Correlations					
	5m Split (s)	10m Split (s)	15m Split (s)	20m Split (s)	25m Split (s)	30m Split (s)
Vertical Jump Height (cm)	-0.612	-0.588	-0.559	-0.538	-0.578	-0.564
Vertical Jump RSI <sub>mod</sub>	-0.413	-0.359	-0.323	-0.258	-0.280	-0.298
Vertical Jump Propulsive Impulse	-0.612	-0.539	-0.48	-0.569	-0.584	-0.564
Drop Jump Height (cm)	-0.333	-0.381	-0.359	-0.386	-0.407	-0.333
Drop Jump RSI	-0.500	-0.524	-0.551	-0.482	-0.455	-0.405
Drop Jump Propulsive Impulse	-0.571	-0.595	-0.611	-0.602	-0.587	-0.619
	2024 Correlations					
	5m Split (s)	10m Split (s)	15m Split (s)	20m Split (s)	25m Split (s)	30m Split (s)
Vertical Jump Height (cm)	-0.695*	-0.835**	-0.827**	-0.830**	-0.821**	-0.806**
Vertical Jump RSI <sub>mod</sub>	-0.872**	-0.829**	-0.742*	-0.733*	-0.717	-0.697*
Vertical Jump Propulsive Impulse	-0.506	-0.470	-0.559	-0.552	-0.517	-0.479
Drop Jump Height (cm)	-0.455	-0.635	-0.595	-0.595	-0.595	-0.595
Drop Jump RSI	-0.252	-0.299	-0.214	-0.214	-0.214	-0.214
Drop Jump Propulsive Impulse	-0.527	-0.683	-0.810*	-0.810*	-0.810*	-0.810*

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$