

## Observation of Jump Height, Peak Propulsive Force, Braking Force, and Loading Force in Acrobatics and Tumbling Athletes During a Complete Season: Pilot

KATELYN KOLODZIEJCZYK<sup>1</sup>, JACI DAVIS<sup>1</sup>, ALYSSA FATERKOWSKI<sup>1</sup>, NIKOLAS KERATSOPOULOS<sup>1</sup>, ROBERT MILLS<sup>1</sup>, JAYDEN WIDENER<sup>1</sup>, LEM TAYLOR<sup>1,2</sup>, AND MANDY PARRA<sup>1</sup>

<sup>1</sup>Human Performance Lab; School of Exercise and Sport Science; University of Mary Hardin-Baylor; Belton, TX

<sup>2</sup>Doctor of Physical Therapy Program; School of Health Professions; University of Mary Hardin-Baylor; Belton, TX

Human Performance Lab, Exercise and Sport Science, University of Mary Hardin-Baylor; Belton, TX

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Category: Undergraduate

Advisor / Mentor: Parra, Mandy ([mparra@umhb.edu](mailto:mparra@umhb.edu))

### ABSTRACT

Acrobatics and tumbling is a women's sport comprised of 3 different positions: base, top, and tumbler. Each position endures substantial impact on the musculotendinous unit, however, tumblers experience the greatest lower extremity eccentric impact leading to a high injury rate. Consistent athlete monitoring may lead to injury prevention and better insights into training. **PURPOSE:** The purpose of this study is to pilot observational differences in jump height (JH), peak propulsive force (PPF), peak braking force (PBF), and peak landing force (PLF) during the counter movement jump (CMJ) in acrobatics and tumbling between tumbler and non-tumbler athletes during a competitive season. **METHODS:** Thirty-three female acrobatics and tumbling athletes volunteered for this study and performed jump testing 3 days per week during their competition season. Data was filtered to include only subjects ( $n = 15$ ;  $19.6 \pm 1.0$  yrs,  $160.7 \pm 7.156$  cm;  $63.5 \pm 17.9$  kg) ten tumblers ( $160.12 \pm 7.02$  cm;  $57.5 \pm 19.1$  kg) and five non-tumblers ( $162.2 \pm 3.27$  cm;  $71.8 \pm 10.0$  kg) that had consistent compliance during the six-week period. Participants performed three CMJs using Hawkin Dynamics force plates and software with each CMJ separated by a ten second rest. Data was analyzed using SPSS using a 2X6 (position X time) ANOVA ( $p < 0.05$ ) for all variables as well as their percent change across time. Follow up t-tests were run when significant main effects were found. **RESULTS:** No significant main effects for time were found ( $p = 0.95$ ) and there was no significant interaction between time and position ( $p = 0.97$ ). There was a significant main effect for position ( $p = 0.006$ ). Follow up analysis observed significant differences in JH, PPF and PBF ( $p < 0.05$ ,  $p < 0.001$ ,  $p < 0.001$ ), but no significant difference in PLF ( $p = 0.18$ ). JH and PLF were significant ( $p = 0.001$ ,  $p = 0.02$ ) when assessed for percent change over time. There was no significance for percent change in PPF ( $p = 0.57$ ) or PBF ( $p = 0.30$ ). **CONCLUSION:** This was a pilot study to observe changes eccentric and concentric loading throughout the competitive season of a DIII acrobatics and tumbling team. When collapsed across time, tumblers experienced greater decline in JH, PPF and PBF throughout the season.