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Positional Difference in Linear Momentum During Vertical Jump in Division II College Football Players

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Linear momentum, the product of body mass and velocity, is the key determinant of the outcome of collisions. In collision-based sports, such as American football, players with the greatest momentum tend to achieve more favorable outcomes during on-field collision, or tackles. Therefore, today's players are constantly seeking to increase mass without sacrificing velocity. However, no study has quantified linear momentum in American football players.

PURPOSE: To examine the positional differences in linear momentum during a vertical jump in Division II college football players. **METHODS:** 56 male Division II college football players were assessed for height, body mass, and vertical jump. All players were categorized according to playing position into defensive back (DB), defensive line (DL), running/full back (RB), linebacker (LB), offensive line (OL), tight end (TE), and wide receiver (WR) groups; all other positions were excluded due to insufficient sample. Height and body mass were assessed using a stadiometer and digital scale, respectively. A vertical jump test was performed to determine jump height, which was then used to calculate vertical jump velocity. Vertical jump momentum (VJM) was calculated as the product of body mass and vertical jump velocity. Positional comparisons in VJM were made using one-way ANOVA with LSD post hoc comparisons. Alpha level was set *a priori* to $p \leq 0.05$. **RESULTS:** A significant main effect of position was observed for VJM ($p < 0.001$). Post hoc tests revealed that OL (439.6 ± 44.7 Ns) had significantly higher VJM than DB ($p < 0.001$; 317.3 ± 34.4 Ns), RB ($p = 0.001$; 371.7 ± 24.7 Ns), LB ($p = 0.006$; 376 ± 32 Ns), TE ($p = 0.013$; 377.4 ± 51.9 Ns), and WR ($p < 0.001$; 338.6 ± 25.0 Ns), while trending to be greater than DL ($p = 0.089$; 406.9 ± 59.6 Ns). Also, DL had significantly greater VJM than DB ($p < 0.001$) and WR ($p = 0.001$), and trended to be greater than RB ($p = 0.068$). LB ($p = 0.009$), TE ($p = 0.013$), and RB ($p = 0.004$) had significantly greater VJM than DB, but only RB trended to be greater than WR ($p = 0.086$). **CONCLUSION:** While positional differences in VJM exist in collegiate American football, positions that regularly engage during game play (OL vs DL, WR vs DB, and LB vs RB vs TE) have no statistically significant differences. Therefore, these positions are most likely evenly matched when colliding on the field.