NEUROBIOPHYSICAL DIFFERENCES IN COUNTERMOVEMENT JUMP PERFORMANCE ACROSS NCAA DIVISION II SPORTS

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PURPOSE

The purpose of this study was to assess relationships between neurobiophysical proponents of athletic performance and countermovement jump height (CMJH) between NCAA Division II basketball, football, golf, soccer, and volleyball athletes.

METHODS

- 93 NCAA Division II athletes participated in this study. Athletes from the university's football (FB; n=15), men's basketball (MBB; n=15), women's basketball (WBB; n=15), women's golf (WG; n=8), women's soccer (WS; n=26), and women's volleyball (WVB; n=14) teams participated in this study.
- The vertical GRFs during the maximal effort CMJs were sampled at 1000 Hz using a wireless dual force plate system (Hawkin Dynamics Inc., Maine, USA). A Pearson's r correlation analysis determined the relationship between neurobiophysical proponents and CMJH.

RESULTS

Unique relationships between CMJH and neurobiophysical measures were identified for each sport ($r = 0.999 – 0.700$; $p < 0.001$).

- Jump velocity
- Peak propulsive power
- Modified reactive strength index
- Braking phase duration
- Braking phase impulse

- Jump velocity
- Peak rel. propulsive power
- Peak propulsive power
- Positive net impulse
- Braking velocity

- Jump velocity
- Rel. propulsive net impulse
- Peak propulsive power
- Modified reactive strength index
- Jump momentum

- Tendon stiffness
- Jump velocity
- Rel. propulsive net impulse
- Propulsive power
- Propulsive force

- Jump velocity
- Rel. propulsive net impulse
- Peak propulsive power
- Modified reactive strength index
- Impulse ratio

- Jump velocity
- Peak rel. propulsive power
- Rel. propulsive net impulse

CONCLUSION

- There are strong-positive significant relationships between jump velocity, propulsive power, and adequate kinematic sequencing as expressed via the measurement of propulsive impulse and enhanced CMJ performance.
- Additionally, unique differences in sport-specific neurobiophysical proponents to CMJH were identified which may also be useful for developing targeted and well-timed approaches for improving jumping performance.

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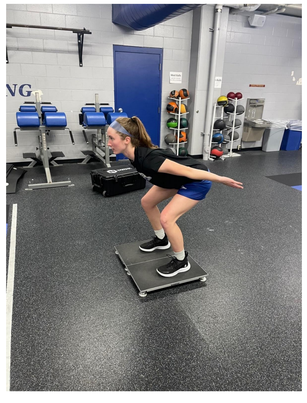

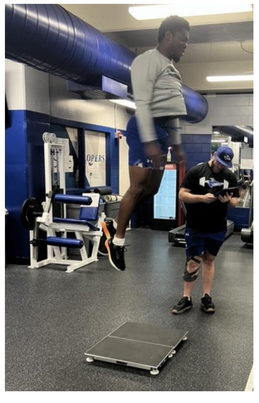

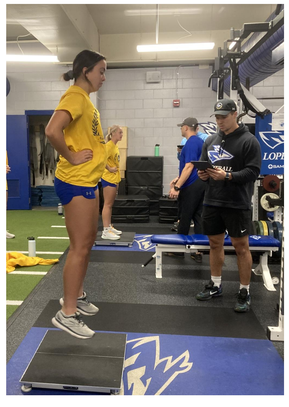

NEUROMUSCULAR MEASURES

- Rate of Force Development
- Time to Takeoff
- Impulse
- Reactive Strength Index

BIOMECHANICAL MEASURES

- CMJ Depth
- Unweighting Phase (s-%)
- Braking Phase (s-%)
- Propulsive Phase (s-%)

PHYSICAL PERFORMANCE MEASURES

- Relative to Weight
- Jump Height Flight Time
- Momentum Stiffness
- Force Velocity Power

PRACTICAL APPLICATION

- The results from this investigation suggests ***that jumping velocity, jump-phase specific power and force, and kinematic sequencing*** should be emphasized within strength and conditioning programs if the goal is to improve CMJ performance, which may subsequently improve athletic performance.
- A general recommendation for the ***development of athletic performance*** characteristics would be an emphasis on developing athletes through a three-fold approach that ***emphasizes the development physical, biomechanical, and neuromuscular systems***.