OPTIMIZING POSITION ASSIGNMENTS IN DIVISION I SOFTBALL PLAYERS USING INTER-POSITION PHYSICAL PERFORMANCE DIFFERENCES: A PILOT STUDY

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BACKGROUND

- Optimizing defensive position assignment in collegiate softball is potentially critical for team success, as placing individuals in nonoptimal positions may increase the likelihood of committing defensive errors.
- Limited research exists directly comparing anthropometric and performance variables between infield (INF) and outfield (OUT) players at the elite or sub-elite level.
  - Previous studies in baseball and softball players mostly focus on comparing body composition rather than performance.[1-3]
  - One previous study shows OUT has greater relative strength than INF, though additional tests may be critical for differentiating players.[4]
- As limited data exists, analyzing the inherent physical performance differences between INF and OUT players on elite teams may provide insight into optimal position assignment.

PURPOSE

- To classify collegiate softball player defensive positions by measuring strength, power, speed, change of direction (COD), and sport-specific performance differences via pre-season performance testing.

RESULTS

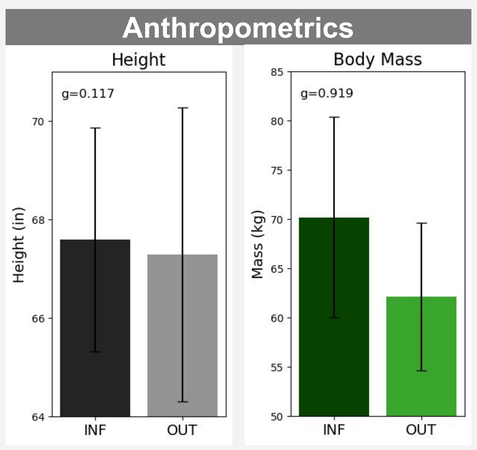

Figure 1: Anthropometric differences between INF and OUT.

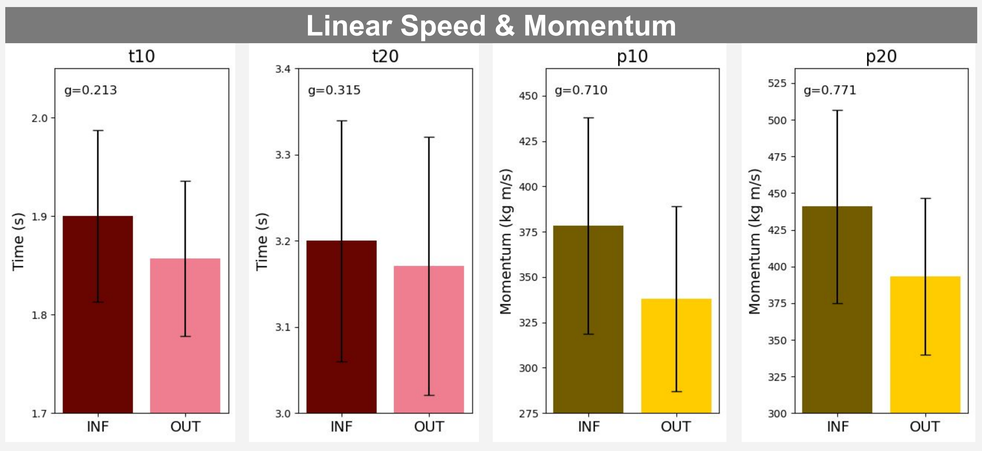

Figure 2: Linear Speed & Momentum differences between INF and OUT.

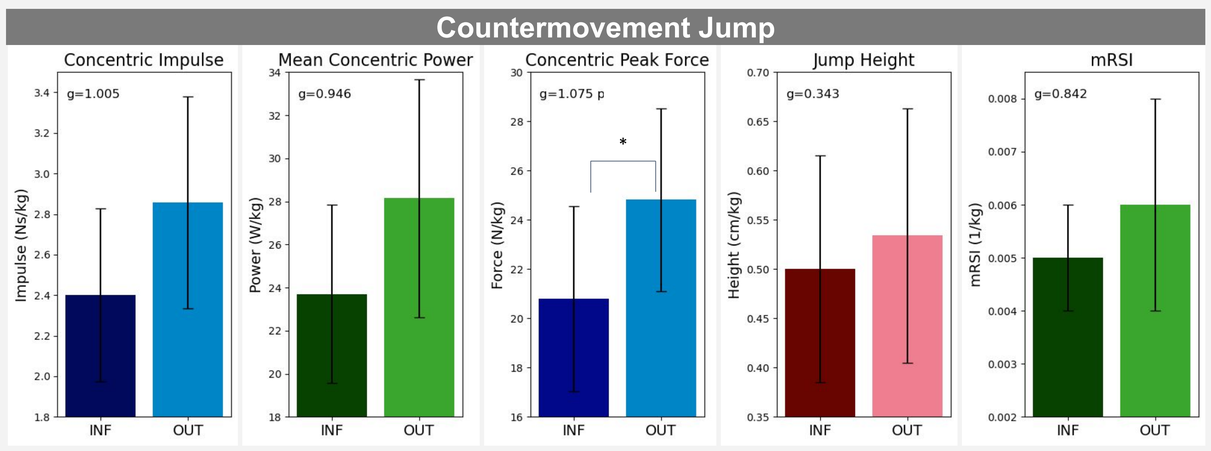

Figure 3: Countermovement jump parameter differences between INF and OUT. Statistically significant differences are noted with * (p<0.05).

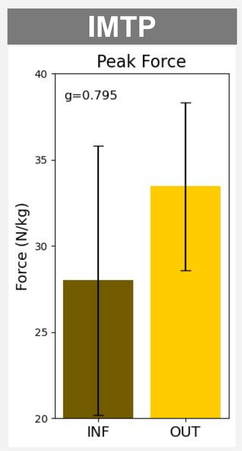

Figure 4: Peak isometric mid-thigh pull (IMTP) force differences between INF and OUT.

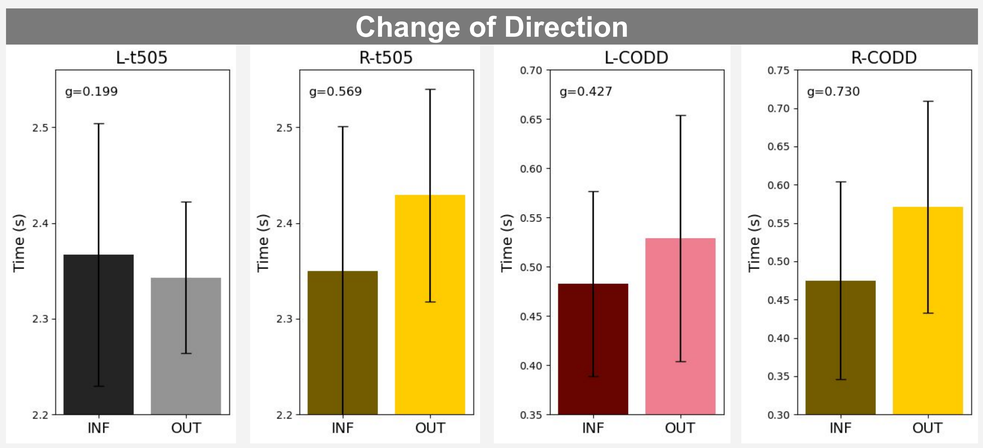

Figure 5: Change of direction (COD) differences between INF and OUT.

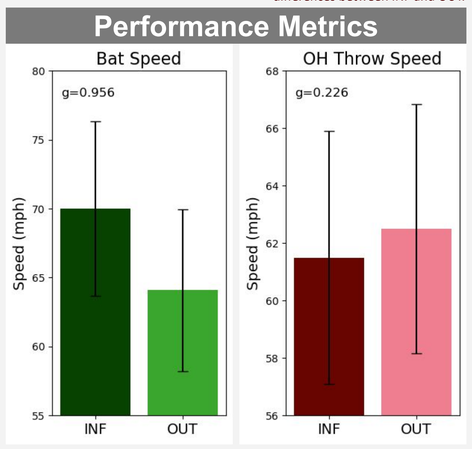

Figure 6: Bat and throw speed differences between INF and OUT.

CONCLUSIONS

- These results suggest there are inherent physical performance differences between softball players in different position groups.
- OUT demonstrate superior speed, relative strength & power, and throwing abilities, while INF demonstrate superior COD, bat speed, and body mass – markers which may be useful for assigning player positions.
- Further study with greater statistical power is necessary to validate these conclusions.

Hedge's g	Effect Magnitude
< 0.20	No Effect
0.20-0.49	Small
0.50-0.79	Moderate
0.80-0.99	Large
> 1.00	Very Large

Table 1: Color coding legend for effect size calculated using Hedge's g for Figures 1-6.

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METHODS

- 12 infield (INF) and 7 outfield (OUT) softball players at an NCAA Division I school (n=19) were evaluated.
- Position groups (PG) were designated by the team's coaching staff based on their primary role as INF or OUT.
- **Anthropometrics**
  - Height & Body Mass
- **Relative Strength & Power**
  - Isometric mid-thigh pulls (IMTP) and countermovement jumps (CMJ) were completed using a dual force plate system.
  - IMTP & CMJ metrics were normalized using player BW.
- **Sprint speed & Momentum (p)**
  - 10m (t10) and 20m (t20) sprints were timed with laser timing gates.
  - Momentum was calculated by multiplying player mass with average 10m (p10) and 20m (p20) test velocity.
- **Change of Direction (COD)**
  - COD was measured using left and right 505 agility test (L-t505, R-t505) results.
  - Left and Right COD deficit (L- or R-CODD): CODD = t505 - t10
- **Sport-Specific Performance Metrics**
  - Bat speed was measured using an accelerometer and throw speed was measured using a radar gun.
- **Statistical Methods**
  - Group comparisons: Independent Samples T-Tests ($\alpha = 0.05$)
  - Effect size: Hedge's g (Table 1)

DISCUSSION

- INF had much greater mass (g=0.919) but similar height to OUT (g=0.117).
  - Body composition analyses in softball athletes show that OUT generally show lower body fat % than INF.[2,3]
  - Pitchers, independent of other INF positions, show very large difference in mass vs OUT (g=1.24).
- OUT had much greater normalized CMJ impulse, mean power, peak force, and mRSI than INF (g>0.8; Figure 3) along with moderately greater normalized IMTP force than INF (g=0.79; Figure 4).
  - This corroborates previous evidence showing OUT have greater relative strength[4], but position differences in relative power and impulse are novel.
- Though differences in absolute speed were small (g<0.5), moderate differences in linear momentum (g>0.5), shown to be a useful talent ID & performance monitoring marker in other sports[5-7], are of interest for future research.
- INF demonstrate superior right-side COD ability but not left (Figure 5).
  - Asymmetric COD abilities may be a result of imbalances in where the ball is most frequently hit during defensive play or batting stance, especially for INF who have greater agility demands, but further study is needed.
- INF show greater bat speed, correlating with increased absolute strength[8], while OUT show greater throw speed, reflecting positional demand during play.[4,8]

PRACTICAL APPLICATIONS

- **Coaching**
  - Position group differences in elite and potentially sub-elite players may be used to inform future coaching decisions for position assignment and identifying position-specific talent.
- **Research**
  - More robust samples with higher testing frequencies may be used to create more comprehensive models (e.g. clustering) to further optimize position assignment.

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