DATA ANALYSIS

PROTEUS POWER NORMS FOR BASEBALL

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November 2023

This white paper serves as research around the importance of individualizing testing and training among athletes of different ages, maturities, body types, and sports. Based on Proteus Motion user data, this white paper shows the comparison of data, such as velocity, power, and speed, among a group of selected athletes.

PROTEUS MOTION WHITE PAPER

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PROTEUS POWER NORMS FOR BASEBALL

Introduction

It is widely assumed that athletes at different levels of skill and physical maturity possess different levels of athleticism. Furthermore, although strength is important, it is becoming more widely accepted that velocity, acceleration, and power are perhaps even more important to an athlete's success. This is particularly true where a combination of speed and strength is needed. Power as a metric is gaining popularity as being an important way to measure this ability as it measures the combination of force and velocity.

Methodology

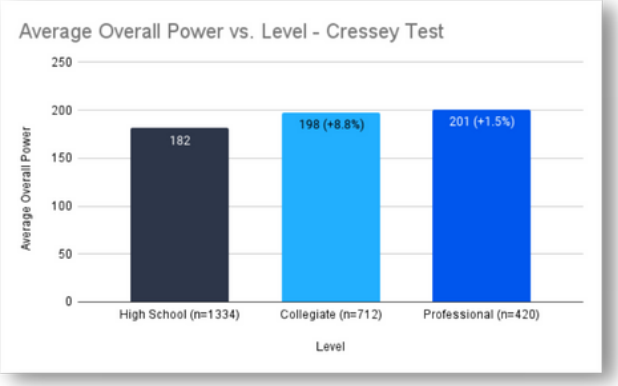
However, there is very little reference data to indicate what the normal power output should be for athletes at different levels of development and skill.

The purpose of this investigation is to look at Proteus data and identify the normal differences between athletes at different skill levels of a sport. Our first investigation looks at baseball players who have taken a full-body power test designed by world-renowned strength coach and trainer Eric Cressey to assess the specific movements required for baseball. The test includes the following movements:

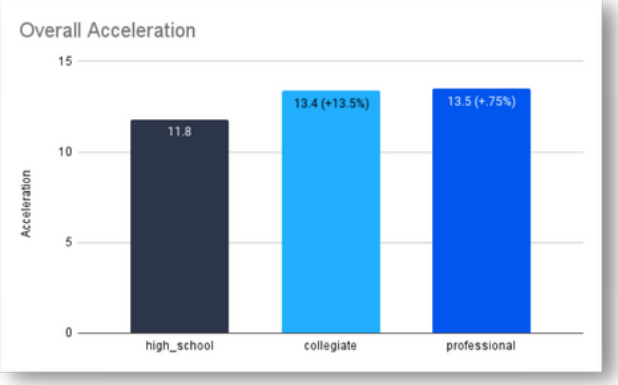
- Unilateral Chest Press + Unilateral Horizontal Row
- Straight Arm Trunk Rotation
- Straight Arm Trunk Rotation (Plyo)
- PNF D2 Flexion + PNF D2 Extension
- Lateral Bound
- Shot Put
- Vertical Jump

Overall Power and Acceleration Changes From High School to College to Professional

Starting with the overall average peak power of the test - taking the peak power of each movement and then looking at the average of this power across the entire test - and stratifying by skill level, we sampled 1,334 High School players, 712 College players, and 420 Professional players.



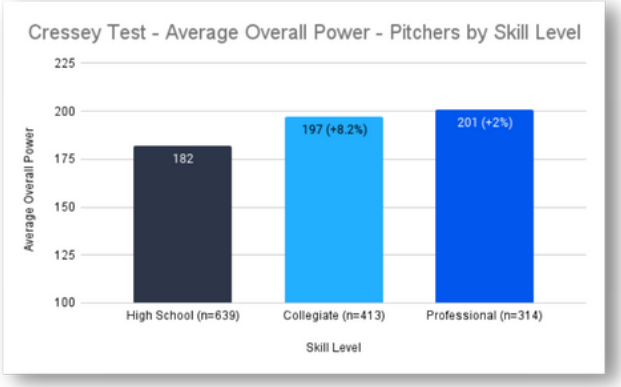
Power increased 8.8% from High School level to College level, but only 1.5% from College level to Professional level.



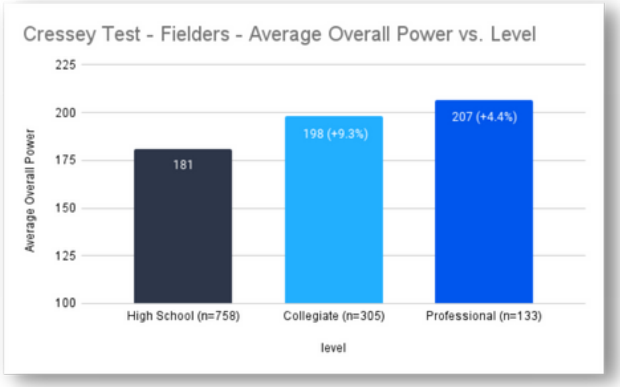
There is a slightly different story for acceleration. There is a 13.5% increase from High School level to College level, and .75% increase from College level to Professional level.

Pitchers vs. Fielders

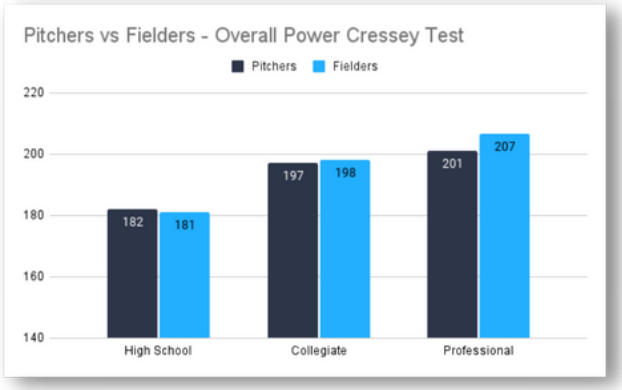
Taking a look at specific baseball positions, we break it down a bit further and note the difference between pitchers and the fielding positions as a whole.



We see pitcher power increase 8.2% from High School to College and 2% from College to Professional.



Fielding positions increase at a slightly faster rate: 9.3% from High School to College and 4.4% from College to Professional.



When comparing High School pitchers and fielders, pitchers possess slightly higher overall power; After High School, fielders possess greater power.

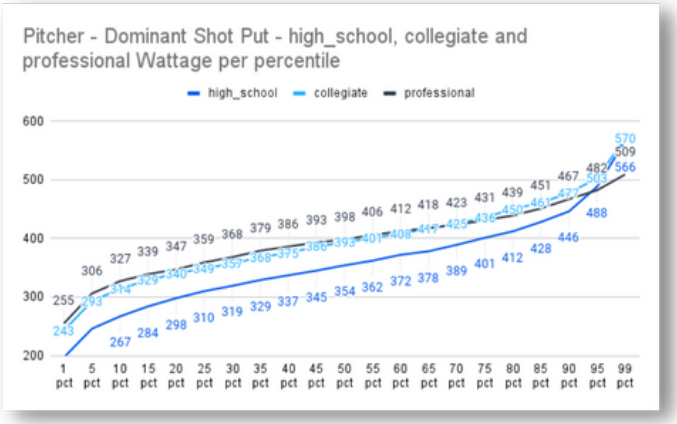
Pitcher Breakdowns by Movement

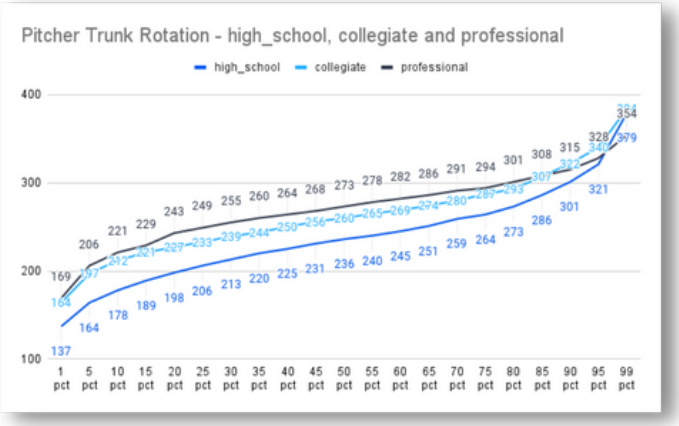
Looking for significant differences in these trends for certain movements, we broke down the tests into the 3 key movements we've seen be predictive of performance in the past: Shot Put, Trunk Rotation, and Vertical Jump.

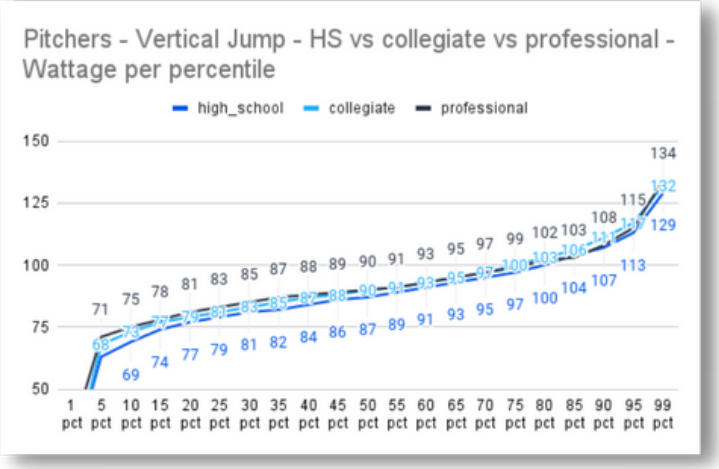
As we look across percentile rankings, the data gets more interesting:

- The average player (50th percentile) show the trend mentioned above
- The professional athlete maintains power over the collegiate athlete
- The collegiate athlete maintains power over the high school athlete

However, there is a noticeable crossover effect where the more powerful, elite collegiate players begin surpassing the elite professional athletes.



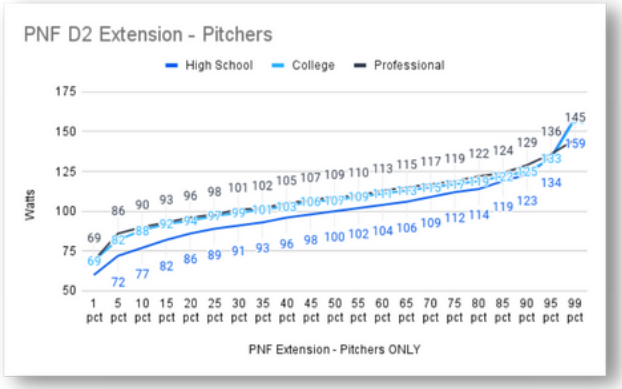




This occurrence begins at the 75th percentile for the Vertical Jump, the 70th percentile for the Shot Put, and the 85th percentile for Trunk Rotation. There are times when the most elite High School players surpass the Professional athlete. In both instances of the Shot Put and the Trunk Rotation, the top 95th percentile of High School players possess more power than the top 95th percentile of Professional players.

PNF D2 Extension

Interestingly, we never see this crossover for pitchers with the D2 Extension.

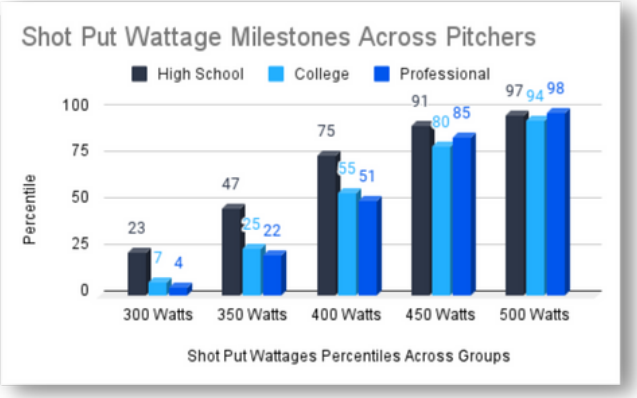


The only time a crossover displays a lower skill level higher than the Professional athletes is above the 95th percentile. It is likely because the difference in the skill of the most elite professional players is likely not due to power, whereas that could remain true for the collegiate and High School game.

Wattage Milestones Across Groups

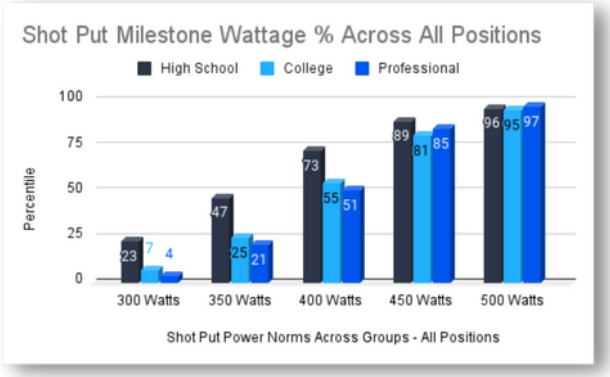
Shot Put

Another way this data is displayed is by the particular percentile wattage ranks at the different levels of the sport.

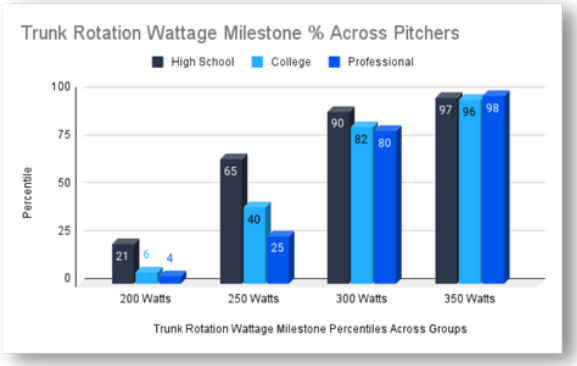


400 watts in the Shot Put places the athlete in the 75th percentile for High School, but only in the 55th and 51st percentile for College and Professional, respectively.

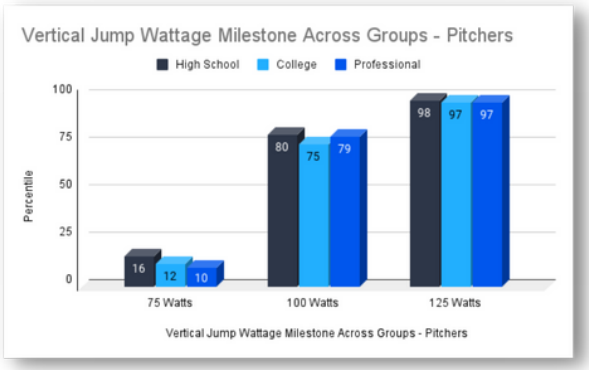
The result across ALL positions offers a similar result:



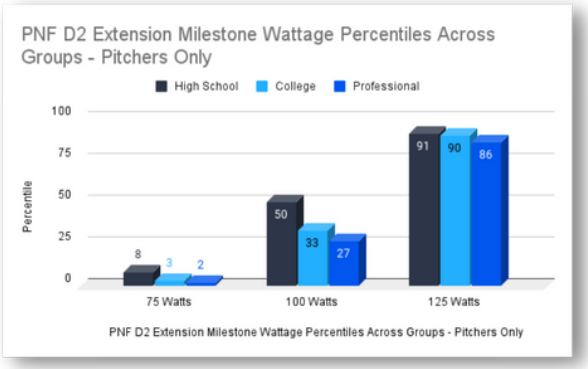
Trunk Rotation



Vertical Jump



PNF D2 Extension



Discussion

Overall Power

There is a big change in athleticism from the High School level to the collegiate level. This holds for all positions but is particularly true with pitchers. There is less power gain from the collegiate to Professional level in pitchers AND their overall power is less than fielders in College and Professional, with a much bigger gap in the pros. This likely indicates that pitching is differentiated more by skill on who gets to the professional level, rather than the raw power development.

Normative Power in Key Movements

This data provides us a glimpse at power-level distribution across the skill levels, enabling us to make a couple of key observations:

1. Of the key movements explored, there is a crossover point where the elite college players surpass the elite pros in power development. Again, this likely points to the fact that pros may not rely on raw athleticism for their success.

2. Training volume: In talking with Jarrett Phillips, long-time trainer of golfers and baseball players, one theory is that we don't see jumps at the high level of pros because their training volume is so low. They have long seasons and short off-seasons, meaning that developing elite levels of power may be more difficult for them as they have less time to spend in the weight room. High School and College players by contrast arguably have more opportunities to work on their power development.

This trend remains true for all movements except for D2 Extension in pitchers. Of the movements tested, the D2 extension most simulates the demands placed on the shoulder with throwing. A crossover where the athletes in the lower skill level surpass the group above is almost never witnessed. This is most likely because, for pitchers there is an inherent demand for raw power development of the shoulder.

Milestones

This data has given us the opportunity to identify key milestones across many skill levels. We're able to see how 300 watts in a Shot Put ranks an athlete among the different skill levels, serving as a reference point for normative comparison of athletes' training.