

Athletes Have Significant Imbalances Between Strength and Speed

78% of Athletes that are above the 50th percentile in power production have an imbalance of strength and speed, with a majority of those falling into the strength dominant category.

by Will Waterman, PT, DPT, OCS, PRT, COMT, CSCS

Abstract

Data collected on the Proteus Motion system was utilized to measure the difference in the performance of power and acceleration of athletes. Performance was categorized into 1 of 4 classifications: Low Strength, Strength Dominant, Speed Dominant, or High Strength and Speed. Results showed that of the athletes that possess baseline strength (those above 50th percentile in power), a majority (78%) possess imbalances of strength and speed—with over 50% of those individuals possessing higher levels of strength vs speed. The results highlight the importance and need to measure, track, and personalize training programs based on an athlete's needs vs taking a global approach.

Introduction

When creating a training program, specificity is of the utmost importance. Training has been shown repeatedly to only improve what is specifically trained. You cannot improve strength by only training speed. You also cannot improve speed by only training strength.

However, due to the difficulty of measuring strength and speed consistently, it has been very hard for trainers to know exactly which athletes need to focus on speed versus which athletes need to focus on strength. Therefore most athletes are placed on the same training program even if they need to focus on different aspects of training.

Methods

To analyze athletes in our database and get a sense of where individuals are categorized against their peers historically, Proteus analyzed males from 20-30 years old across all of our locations who performed the same standardized test (Cressey Performance Test) from September 1, 2021 to Aug 31, 2022. This is an ideal test for evaluating the performance of rotational sports. It was specifically designed for baseball players but is also used with Tennis, Golf, MMA, and other athletes. The test consists of the following movements (17 total), 5 reps each, at max effort, performed in the standing position, on the left and right unless otherwise noted:

- **Single Hand Horizontal Push**
- **Single Hand Horizontal Pull**
- **PNF D2 Flexion**
- **PNF D2 Extension**
- **Static Start Straight Arm Trunk Rotation**
- **Counter Movement/Plyo Straight Arm Trunk Rotation**
- **Lateral Bound**
- **Counter Movement Vertical Jump (not performed unilaterally)**
- **Full Body Rotational Shot Put**

Categorization

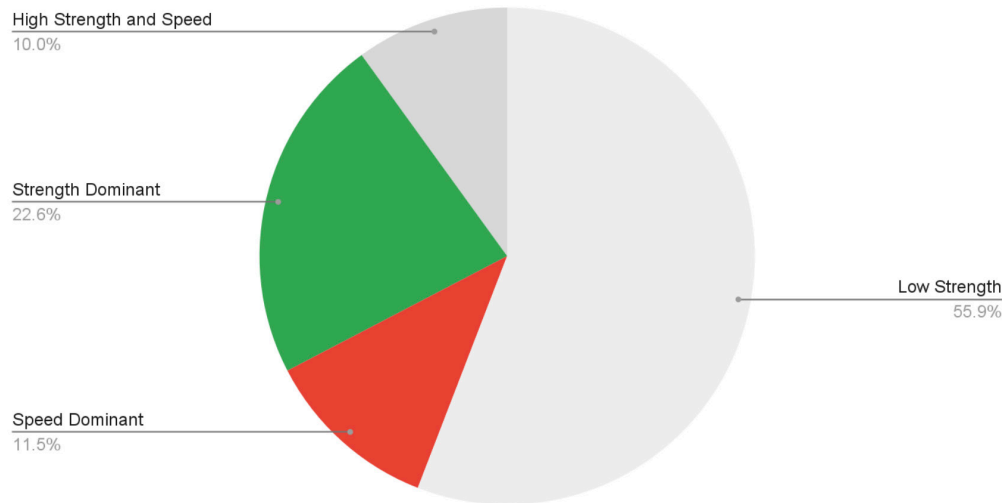
We then categorized athletes into 4 specific classifications based on their overall average percentile rankings of all movements in both power and acceleration among all males between 20-30 years old. Below are the criteria for these classifications:

LOW STRENGTH	SPEED DOMINANT	STRENGTH DOMINANT	STRENGTH & SPEED
Individuals that fall below the 50% baseline of power production	Individuals that possess baseline power (>50 percentile) but have a significantly higher amount of speed production over strength (>5 percentile points acceleration over power)	Individuals that possess baseline power (>50 percentile) but have a significantly higher amount of power production over speed (>5 percentile points power over acceleration)	Individuals that possess baseline power (>50 percentile) and have a balanced amount of speed and strength production (<5 percentile points difference between power and acceleration)

Results

A total of 616 tests were analyzed for a total of 52,360 reps (616 tests x 17 movements x 5 reps each). 55.9% fell into the Strength Deficit category, 22.6% into the Strength Dominant, 11.5% into Speed Dominant, and 10.0% into the Balance of Strength and Speed.

Males 20-30 Years Old - All Locations - Cressey Test - Classification Breakdown (n=616)



Discussion

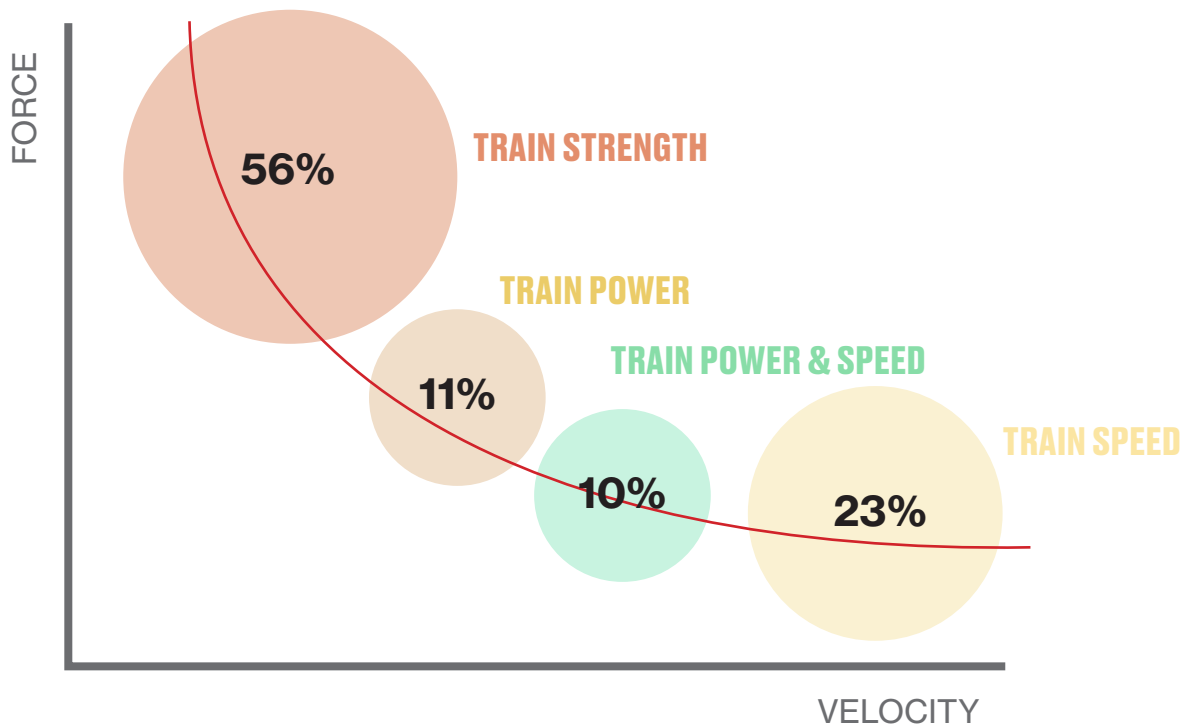
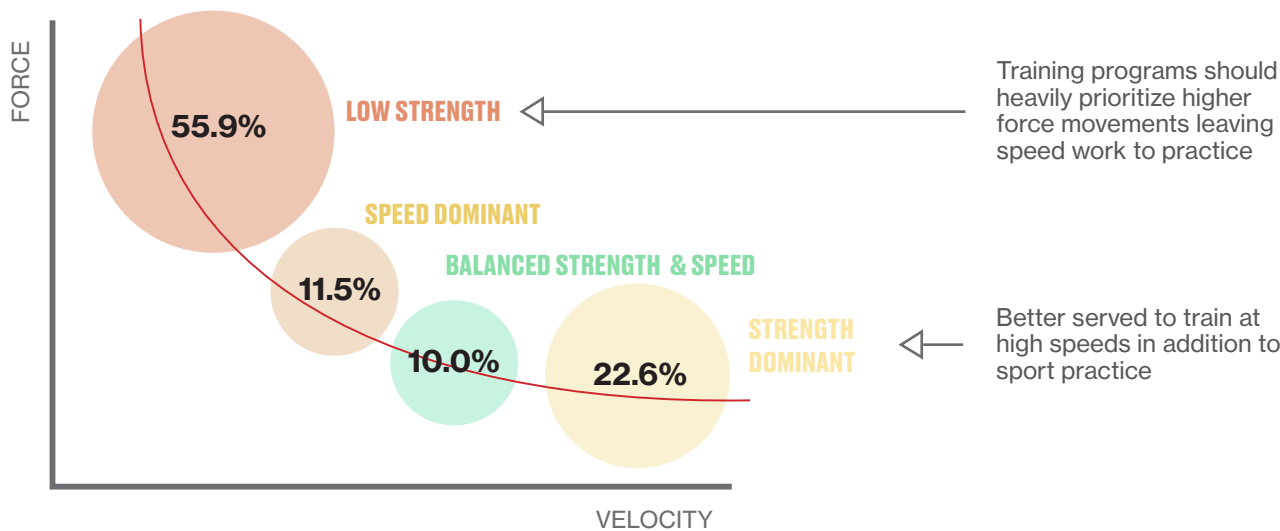
First, we found that 55.9% of athletes fell into the category of strength deficit. These athletes need to build their foundational strength before beginning to truly develop speed and power.

If we look at the remaining individuals that possess at least the required foundational strength (>50th power percentile, 44.1% of the total), we see that 77% of this group have imbalances of either strength or speed. Over half fall into the Strength Dominant category (22.6% of the remaining 44.1%). This means that over half of the individuals above baseline levels of strength need to work on speed instead of continuing to work on strength.

If these individuals continue to train at high forces and low speeds, they will not be able to reach new levels of speed and power production. In addition, they may actually run the risk of getting slower and therefore actually decrease their performance. There is even a risk of injury if they do not possess the required power and speed for their sport.

Moreover, the fact that the smallest cohort in this retrospective research were individuals with high strength and speed (only 10%) supports the hypothesis that very few people above baseline strength are training properly to achieve the balance they need for their sport.

Implications



In order to optimize training, athletes should train along the force-velocity spectrum according to the classification they fall into. Low Strength athletes should work at the top of the force-velocity spectrum with high-force, low-velocity movements in order to continue to improve force production. On the contrary, athletes classified as Strength Dominant should work at the low end of the force-velocity spectrum, utilizing low-force, high-velocity movements.

If these athletes continue to train with a generic program, many will not get the correct training stimulus they need and will stagnate in their athletic development.

Due to the fact that strength training in the high-force, low-velocity spectrum is, in general, over-emphasized, this work highlights the particular need for more specific mid-velocity to high-velocity training. When you consider that strength gains are relatively long lasting compared to gains in speed and power, this gives further evidence that power and speed training specific to the athlete's need is an important consideration with program design and should be monitored and adjusted continuously along with other considerations such as sports practice, competition, and overall program periodization.

Summary

A retrospective data analysis of males between 20-30 years old utilizing Proteus 3D Resistance recorded power and acceleration metrics shows that 77% of individuals that possess above baseline levels of strength have an imbalance of strength vs speed. Individuals with these imbalances should train specifically on the force-velocity spectrum where they are least proficient in order to continue to improve performance. It is critical that training programs are personalized to see optimal performance improvements.