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Can Functional Tests Predict Throwing Velocity or Batting-Exit Velocity in Division III Collegiate Baseball: A Predictive Validity Investigation

Lucas Stetter
Ohio Wesleyan University

Luigi Russo
Ohio Wesleyan University

Functional Tests Predict Throwing Velocity and Batting-Exit Velocity in Division III Collegiate Baseball Players: A Predictive Validity Investigation

Ohio Wesleyan University
DEPARTMENT OF Health and Human Kinetics

Lucas Stetter, Luigi Russo, Dr. Andrew Busch
Ohio Wesleyan University, Delaware, OH

INTRODUCTION & PURPOSE

Throwing velocity and batting exit-velocity are important factors that determine success in the sport of baseball. Although proper mechanics for both throwing and batting are greatly important, the growth of sport science has transitioned to investigate other physical attributes in attempt to improve sport performance. There is ample research on the benefits of resistance training in the form of free weights, band-tubing, medicine balls, and isokinetic machines on throwing velocity, but very few studies have explored the relationship between a variety of functional tests and actual throwing and batting velocity.

The purpose of this study was to examine the relationship between upper-body and lower-body flexibility, strength, power, and stability with respect to on-field performance metrics. Our hypotheses were that strong correlations would exist between the functional tests and and on-field metrics which could then be used to improve player development.

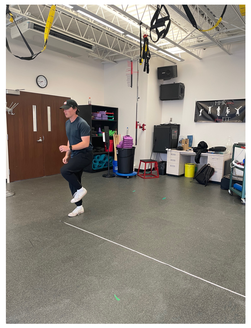
METHODS

- Flexibility was tested by measuring ROM for hip and shoulder internal and external rotation laying supine on a table, and thoracic mobility while in a lumbar-locked position. All of these were measured using a digital goniometer. Shoulder and hip ROM was a passive test while thoracic ROM was an active test.
- Full body stability was tested using the (FMS) Y-Balance Lower and Upper Quarter test.
- Shoulder stability was tested with athletes performing two trials of the Davie's Closed Kinetic Chain test.
- Grip strength was tested using a hand-held dynamometer.
- Full body strength was tested by performing an Isometric-Mid Thigh Pull (IMTP)test. Athletes stood on a force place with a fixed barbell halfway between the top of the patella and the anterior superior iliac spine of the pelvis and performed a 3- sec. maximum isometric pull.
- Vertical power and explosiveness was tested using a countermovement vertical jump test on a force plate.
- Rotational power and explosiveness was tested by performing a maximal rotational medicine ball (MB) toss with a four-pound MB.
- Throwing velocity was was tested by 5 maximum effort throws from 15 feet away into a net measured in miles per hour (MPH) with a Pocket Radar gun.
- Batting velocity was tested by hitting off a tee into a net with maximal power for 5 trials and was measured with in miles per hour (MPH) with a Pocket Radar gun.

SUBJECTS

- National Collegiate Athletic Association (NCAA) Division III baseball athletes (n=25, age = 19.40 ± 1.13 years, height = 71.56 ± 2.24 in, weight = 190.76 ± 20.03 lbs., BMI = 26.5 ± 2.36.
- Subjects were excluded if they incurred any time-loss injury greater than 4 weeks prior to testing.
- A university IRB approved this study, and all participants provided informed consent prior to testing.

TESTING

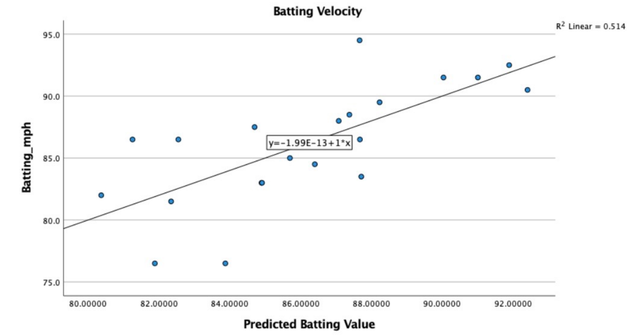


RESULTS

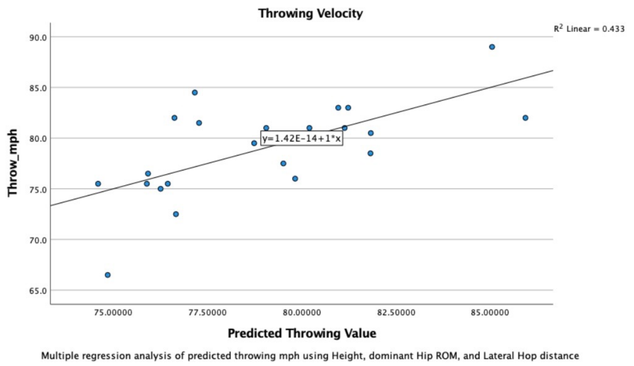
For batting velocity, Pearson's correlations demonstrated strong statistically significant positive relationships with: IMTP, non-dominant grip strength, and jumping RFD values. Using such variables, a multiple linear regression model significantly predicted batting velocity $F(3, 18) = 6.34$, $p = 0.004$, to accounted for 51.4% of the explained variability (adjusted $R^2 = 43.3\%$).

For throwing velocity, Pearson's correlations demonstrated strong statistically significant positive relationships with: height, dominant hip ROM, and lateral hop distance values. Using such variables, a multiple linear regression model significantly predicted throwing velocity $F(3, 18) = 4.59$, $p = 0.015$, which accounted for 43.3% of the explained variability in throwing velocity (adjusted $R^2 = 33.9\%$).

RESULTS



Multiple regression analysis of predicted batting mph using IMTP, non-dominant Grip-Strength and Vertical Jump RFD



Multiple regression analysis of predicted throwing mph using Height, dominant Hip ROM, and Lateral Hop distance

CONCLUSIONS

Maximal batting velocity demonstrated a strong relationship to IMTP strength, non-dominant grip strength, and jumping RFD, and could be accurately predicted through a multiple regression model. While these three were not the only three correlated to batting velocity, they developed the best linear regression model. Maximal throwing velocity demonstrated a strong relationship to height of the athlete, dominant hip total ROM, and dominant leg lateral hop distance. Similarly, these variables were not the only tests that correlated to throwing velocity, but collectively explained the most variability through multiple regression.

PRACTICAL APPLICATIONS

This study validates several different functional tests and their relationship to on-field baseball performance. The significant correlations found give both coaches and trainers a better idea on what to look for when preparing athletes to maximize sport performance. Future research might look to examine if differences exist such in the functional tests between pitchers and position players. Additionally, this research gives coaches specific metrics to use when screening or recruiting athletes.