weekly for 8 weeks. Twice before (separated by 8 weeks), midway, immediately after, and twice after (at 8 and 16 weeks) the EAT program, bradykinesia and motor function was assessed. At each session, to assess bradykinesia, the 8-character sequence 'elelelel' was written in cursive 10 times using a modified digitizer pen on a graphic tablet (Intuous Pro, Wacom Technology Corp, Portland, OR). Movement was recorded using the MovAlyzeR software (Neuroscript LLC, USA) with a sampling frequency of 100 Hz. The mean velocity (m/s), acceleration (m/s^2), and time of writing each letter sequence (s) was recorded. To assess motor function, the motor portion of the Unified Parkinson's Disease Rating Scale (UPDRS) and Fullerton Advanced Balance Scale (FABS) were administered. A repeated measures analysis-of-variance (ANOVA) across the six time points was used to examine change over time with significance set $p<.05$.

RESULTS: There were no differences between UPDRS scores (8wk pre 39±11; pre 42±14; mid 38±10; post 34±13; 8wk post 36±13; 16wk post 41±14; $p>.05$) or FABS scores (8wk pre 30±7; pre 31±7; mid 31±5; post 32±6; 8wk post 31±7; 16wk post 30±6; $p>.05$) across time. There were no differences between mean absolute velocity (8wk pre 0.01±0.01; mid 0.02±0.02; post 0.02±0.02; 8wk post 0.02±0.02; 16wk post 0.02±0.02 m/s; $p>.05$), acceleration (8wk pre 0.02±0.01; mid 0.03±0.03; post 0.03±0.04; 8wk post 0.03±0.04; 16wk post 0.02±0.04 m/s^2; $p>.05$) or time to write each letter peak (8wk pre 0.4±0.06; mid 0.42±0.07; post 0.42±0.05; 8wk post 0.41±0.06; 16wk post 0.41±0.06 s; $p>.05$).

CONCLUSION: Based on preliminary analysis, 8 weeks of EAT maintained motor function in older men with PD. More participants are being recruited to further observe the effects of EAT on PD symptomology.

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G-27 Free Communication/Poster – Sports Biomechanics

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Isolating The Effect Of Grip Strength On Exit Velocity In Male Baseball Players

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Limited evidence suggests grip strength predicts bat speed and hitting distance. However, maturation, anthropometric variables, and muscular strength must be controlled to isolate this relationship.

PURPOSE: To test the effect of grip strength on exit velocity in baseball players.

METHODS: We enrolled 129 male baseball players for testing. We measured grip strength using a Jamar handgrip dynamometer, and assessed it in 3 positions: 0° shoulder abduction and 90° elbow flexion (0/90), 90° shoulder abduction and 90° elbow flexion (90/90), and overhead at 0° elbow extension (overhead). Mean and peak exit velocity were captured using a Trackman Launch Monitor. Age, height, weight, vertical jump power, and torso rotation power were used as controls. Kinematic assessments were captured using a Proteus device. Linear regression models tested the effect of grip strength in each position on exit velocity holding all confounders constant.

RESULTS: Players were 15.5 ± 3.1 years of age, height was 69.2 ± 3.9 in, and weight was 157.1 ± 34.7 lb. Dominant 0/90 grip strength was 45.1 ± 12.9 kg, non-dominant 0/90 strength was 44.5 ± 12.5 kg, dominant 90/90 strength was 38.5 ± 12.3 kg, and dominant overhead strength was 42.1 ± 13.5 kg. Mean exit velocity was 74.8 ± 11.7 mph and peak exit velocity was 78.5 ± 9.6 mph. Holding constant all maturation variables (age, height, and weight), each additional kg of dominant 0/90 grip strength predicted an increase in peak exit velocity of 0.3 mph ($p < 0.001$; 95% CI: 0.161, 0.379). Similar results were found with non-dominant 0/90 strength ($p < 0.001$; 95% CI: 0.163, 0.400), dominant 90/90 strength ($p < 0.001$; 95% CI: 0.138, 0.399), and dominant overhead strength ($p < 0.001$; 95% CI: 0.151, 0.378). When adding muscle performance variables to the model, all assessments of grip strength retained significance ($p < 0.001$; $\beta > 0.250$). Mean exit velocity exhibited more modest effects. Holding maturation and performance variables constant, each kg of dominant 0/90 strength predicted an increase of 0.2 mph of mean exit velocity ($p = 0.006$; 95% CI: 0.068, 0.403). All other grip strength assessments were similar ($p < 0.050$; $\beta > 0.200$).

CONCLUSION: Grip strength is a robust predictor of average and maximum exit velocity in baseball players. These effects were independent of age, height, weight, leg power, and rotational power.

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Acute To Chronic Workload Monitoring In Collegiate Baseball Pitchers During Preseason

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PURPOSE: Upper extremity injuries are common in baseball spanning from youth through professional leagues, especially in preseason. Although there are some arbitrary guidelines for number of throws during practices and games, there is no current information on workload during preseason in baseball pitchers. The purpose of this study was to quantify weekly workload for pitchers in a six-week preseason in a collegiate baseball team.

METHODS: Nine baseball pitchers wore a single inertial measurement unit on the forearm during all training sessions of preseason. Movements were captured at 100Hz and classified as a throw when the forearm velocity was greater than 800°/second. Peak angular velocity was exported for each throw and total workload was calculated as the median angular velocity multiplied by total throws for each day. Chronic workload was calculated as the average workload across all six weeks and acute workload was calculated as the average seven-day workload. Acute to chronic workload ratio (ACWR) was calculated for each week. Paired t-tests and Cohen's d effect sizes were used to compare weekly ACWR workload.

RESULTS: An average of 1651.11±738.62 were thrown by each participant throughout the preseason at an average angular velocity of 1968.33±266.48 m/s. Participants had significantly reduced ACWR on week 2 ($p=0.048$; $d=1.07$) and week 4 ($p=0.042$; $d=1.19$) compared to week 6.

CONCLUSIONS: ACWR during the final week of preseason was significantly higher compared to two previous weeks of preseason, suggesting that there may be a need to reduce overload during the final week of preseason. Increased workload over a short time may be associated with greater upper extremity injuries during preseason in collegiate baseball. Monitoring pitching workload using peak angular velocity through a single IMU may provide valuable insight to the sports performance team to prevent chronic overuse injury. Additionally, this can be used to design a progressive overload training during preseason.