IMPLEMENTATION AND EVALUATION OF A BASEALL PITCHING PROGRAM AND ITS IMPACT ON INJURY PREVENTION AND PERFORMANCE

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INTRODUCTION

An average of 25,000 baseball players compete in the National Collegiate Athletic Association (NCAA) every year [1]. Furthermore, 40% of NCAA baseball players will be injured at some point during the season [2]. Key indicators within the pitching motion allow us to monitor player mechanics and improve deficiencies when they are present. Quantitative data from these indicators help monitor performance to screen for signs of kinetic and kinematic deficiencies. The goal of this study was to examine the efficacy of biomechanical evaluations on collegiate baseball pitchers. Through this, we seek to develop a model for identifying at-risk athletes through a longitudinal assessment of pitching mechanics spanning pre-season to post-season along with in-season tracking of pathomechanics.

METHODS

Pitchers from a local NCAA men's baseball team were recruited to attend a pre- and post-assessment session spaced three months apart. Athletes were outfitted with a full-body retroreflective marker set before the acclimation and warm-up session. Once ready, the pitcher was instructed to throw from an indoor, force-plate instrumented mound towards a target located 56' away. Professional grade motion-capture cameras (Qualisys, Gothenburg, Sweden) were mounted on tripods placed symmetrically around the pitching mound to capture athlete motion. Camera sampling frequency was set to 240 Hz. Key biomechanics variables were calculated using Visual 3D (C-Motion Inc., Rockville, MD) software.

Upon completion, members of the research team identified key biomechanical variables previously shown to have the greatest impact on a pitcher's ability to transfer energy throughout the kinematic chain. A member of the research team met with each athlete to discuss where their pitching biomechanics were compared to a series of normative values for college pitchers. Specific pitching drills aimed at addressing each athletes' mechanical needs were prescribed for weekly completion. Recommended variables were marked as corrected if athletes improved pitching their biomechanics towards the normative range.

RESULTS AND DISCUSSION

Seventeen athletes were recruited between pre- and post-assessments. Seven athletes were excluded from the study due to missing either session. Recommended drills included Lead Leg Internal Rotation, Arm Patterning Progressions, Roll-In Progressions, and Rocker Drills. A total of 29 mechanical improvements were recommended, with all but one athlete receiving three to improve upon. Mechanical adjustments included *Shoulder Abduction*, *Pelvic Rotation*, *Pelvic Tilt*, *Trunk Rotation*, and *Stride*.

Athletes were able to correct 20 of 29 (69%) of recommended biomechanical adjustments. Pelvic Rotation, Trunk Rotation, and Stride exhibited the most improvement, with Shoulder Abduction exhibiting the least amount of improvement (Figure 1).

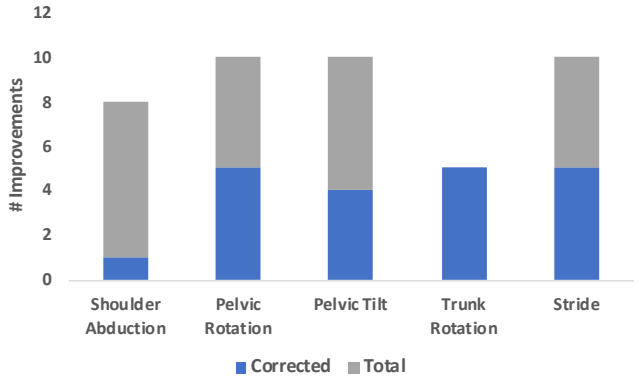

Figure 1: Post-assessment biomechanical improvements made compared to total pre-assessment recommendations

Results from this study showed that pitching biomechanics closer to the start of the pitching motion, such as Stride, Pelvic Tilt, Pelvic Rotation, and Trunk Rotation, had a higher frequency of being corrected compared to biomechanics closer to ball release (Shoulder Abduction). We believe this is due to the amount of time spent performing each action, where a pitcher spends roughly 0.5s in the early cocking phase, 0.11s in the late cocking phase, and 0.03s in the acceleration phase [3]. Previous research has also noted that the rapid amount of movement the arm makes over a short period of time therefore may make correcting upper extremity biomechanics more difficult [4].

CONCLUSIONS

Our comprehensive pitching evaluation demonstrates that 69% of biomechanical adjustments were able to be corrected within a three-month span. Pitching biomechanics closer to the start of the kinematic chain were found to be improved more than biomechanics towards the end. Further pitching evaluations will be conducted to observe the longitudinal impact on injury prevention.

REFERENCES

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