

New study looks at biomarkers in assessing pitch count's bearing on injury

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In baseball lingo, pitch count is the number of pitches thrown by a pitcher during a game. The correlation between pitch count and throwing arm injuries has been a hot-button issue in baseball for years and now is the focus of a pioneering study by the Mercyhurst University Department of Sports Medicine, UPMC Hamot and Shriners Hospitals for Children - Erie. The shared-resources collaboration is funded in part by a grant from the Lake Erie Consortium for Osteopathic Medical Training.

Often a starting [pitcher](#) will be removed from the game after 100 pitches, which is reckoned to be the maximum optimal pitch count for a starting pitcher. But is 100 an arbitrary benchmark?

"It's driven by injury statistics," said project partner Tim Cooney, manager of [basic science research](#) at UPMC Hamot. "But is that a good threshold? Is it universal for every pitcher? Should it be higher, lower?"

Studies have tried to address the questions, but most have looked at the way pitchers throw and how the motion changes with repetition as predictive of fatigue.

The new research project will look at motion, but it will also measure shoulder muscle power and, for what Cooney believes is a first, biomarkers. Biomarkers (short for biological markers) are used widely in medicine to predict serious illnesses like diabetes and cardiovascular disease. Could they predict joint stress in a pitching arm?

Data collection will be held at the Mercyhurst Rec Center and the adjoining Janet Price Human Performance Research Lab on Mondays, Feb. 17 & 24, said project partner Bradley Jacobson, A.T.C., chair of the Mercyhurst Sports Medicine Department. Twelve student-athletes from the Mercyhurst University Lakers and North East Saints baseball teams will serve as test subjects.

Using high-speed motion-capture cameras to track individuals' movements as they throw, the biomechanical analysis will be conducted by the Shriners Hospital under the guidance of project partner Kevin M. Cooney, PT, manager of rehabilitation services and movement analysis at Shriners. He will be assisted by Jake Gdovin, a graduate student in exercise science at Mercyhurst and a graduate assistant at the Shriners Movement Analysis Lab.

Each student-athlete will be asked to throw a total of 80 pitches, altering the number of consecutive pitches and rest periods, at each of the two sessions.

Researchers are looking for scientific evidence linking the effect of consecutive pitches on fatigue.

"This is the first time Shriners has moved its camera system to another location for data collection," Kevin Cooney said. "We all felt it was a necessary challenge, because the project has to simulate real-life conditions to enhance the reliability of test results. We moved six of our 10-camera system onto tripods to surround the baseball pitching mound and allow for each pitcher to throw the normal distance, simulating innings as if they were in an actual game."

Since previous motion studies have shown movement changes to be subtle, Tim Cooney said the team thought to introduce the concept of biomarkers as a measure of potential injury. Samples of student-athletes'

blood drawn before and after pitching sessions will be tested by UPMC Hamot to possibly diagnose joint stress in their bodies.

"Since pitching injuries are primarily of the elbow and shoulder joints, our goal is to try and target a biomarker that would indicate joint stress," Tim Cooney said.

Using Biodex isokinetic muscular testing technology, players will also be evaluated for shoulder power before and after throwing, said Jacobson, who will oversee that process with senior sports medicine/pre-med student Zach Jacobson, who has coordinated this research project to complete his undergraduate academic baccalaureate research project at Mercyhurst.

Each test subject will be evaluated on their ability to produce torque (force) while rotating their throwing shoulder at a specific speed.

"Evaluating the change in power production of the shoulder muscles and combining these findings with the biological marker and biomechanical findings will provide a broad yet specific picture of what is occurring to baseball pitchers as they throw consecutive pitches during the course of a game," Jacobson said. "We would expect this information to spawn future studies and hopefully be used to prevent throwing injuries at all levels of baseball."

Besides being a community partnership that pools resources from major academic and health care institutions, the research project is also part of Mercyhurst's commitment to provide every student with a hands-on learning experience before they graduate.

Among the sports medicine students assisting researchers are Nikki Leri, Kahla Maguire and Alex Giallourakis.

Provided by Mercyhurst University

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