Rochester Institute of Technology
Consent to Participate in a Research Study

1. Key Information about the Researchers and this Study

Study Title: Modeling Trunk Energy Flow in Collegiate Baseball Pitchers Using a Damped Torsion Spring Oscillator and its Relationship to Fatigue and Competitive Performance.
Principle Investigator: Charles Arnold, Undergraduate Student, Student at RIT
Co-Investigator: William Brewer, Director of Exercise Science Program at RIT
Faculty E-mail: William Brewer, **wsbscl@rit.edu**,

You are invited to take part in a research study. This form contains information that will help you make a decision about participating in the study.

This study will measure a subject's Biomechanical Data using 4D Motion wearable Sensors and ProplayAi. We will be measuring angles and angular velocities of the torso and pelvis using the 4D Motion Vest. We are also analyzing ball kinematics such as velocity and spin rates using pitch logic as well as fatigue levels using ArmCare.com dynamometers. All Equipment used in this experiment will be provided by the RIT and MCC baseball team and have been approved by the RIT and MCC Baseball coaching staff.

During pitching session, players will be asked to throw 2-5 pitches wearing the 4D Motion Sensors and using the ProplayAi on the thorax and the pelvis. Players will throw in 2 different environments: A coaching bullpen environment, and a competitive environment. We will be using polar sensors to measure heart rate of activity. The heart rate will elaborate the intensity of a bullpen session vs a competitive environment.

Participation in the Biomechanics Study is voluntary. Please take the time to read this entire form and ask questions before deciding whether to take part in this research project.

2. Purpose of this Study

In this experiment we are looking to analyses the trunk mechanics of the pitching motion using energetics with our 2-part model of the trunk. This study has 3 aims:

1. To compare trunk energetic and arm speed effects between bullpen and "game-like" situations.
2. To examine throwing arm fatigue between bullpen and inner-squad situations in association to trunk energetics.
3. To examine competitive results such as pitch velocity, ball flight outcomes and competitive performance as it relates to trunk energetic profiles.

We believe that while pitching, inefficient energy flow will be hallmarked by greater throwing arm fatigue, increased arm speed, yet denoting lower ball velocities that can be tied to torso energetic analysis. It is also believed that the energetic analysis will show differences between practice and competitive conditions indicating that laboratory versus game-based biomechanical analyses may be considered significantly different, and therefore, baseball biomechanics research in the current scientific climate should consider in-game motion capture profiling to have the greatest benefit to injury prevention and competitive performance.

3. Who can participate in the study

Participants of this study are members of both the RIT and MCC Baseball Team. The RIT and MCC team physicians will medically screen all participants. Subjects who pass the physical and have no current pain when throwing will be admitted as a participant.

A volunteer may be excluded due to their response to the verbal pain evaluation.

A volunteer may also be excluded due to a failed physical by a physician or athletic trainer.

We expect about 12 participants.

4. Information about Study Participation

The data collected through the study is for research purposes only. Participant information will be kept on a password protected shared file on the RIT server, and in locked, secured file containers. Staff will keep all participant data strictly confidential.

The study protocol will include the following steps:

1. Complete the process of informed consent.
2. Complete the process of medical screening.
3. Complete OnBaseU movement screening.
4. Player Warm-Ups
5. Record Pre-test of Internal and External Rotation
6. Throw 2-5x each pitch type using ProplayAi and wearable sensors.
7. Record Post-test of Internal and External Rotation
8. Measure dimensions of thorax and pelvis

5. Information about Study Risks

To ensure each participant is able to participate in the study with minimal amount of physical risk, precautions are taken through our screening process and our activity protocols. Every effort is made to reduce participant risk. Some risks are beyond the research project's ability to detect and control. In the event of a medical emergency, appropriate emergency medical services will be immediately available. The data collection will be conducted in a facility equipped with an AED device. The personnel and facility are prepared for all manner of medical emergencies. During pitching practice sessions, players will be asked to report pain levels at the end of the session.

All risk included in the experiment is commiserate with typical baseball practice. Investigators will utilize data from the medical screenings from the athletic department as well as verbal evaluations to exclude players who demonstrate risk factors. Investigators will utilize medical screenings and pain evaluations to exclude players who experience risk factors before becoming admitted as a participant.

6. Discontinuing the Study

You are free to leave the study at any time. If you leave the study before it is finished, there will be no penalty to you. If you decide to leave the study before it is finished, please tell one of the persons listed in Section 9. “Contact Information”. If you choose to tell the researchers why you are leaving the study, your reasons may be kept as part of the study record but remain confidential. The researchers will keep the information collected about you for the research unless you ask us to delete it from our records. If the researchers have already used your information in a research analysis it will not be possible to remove your information.

7. Participant Incentives

No subjects will be paid or compensated for this research study. To be part of the study, no participants will need to pay for anything.

8. Protecting and Sharing Research Information

We will not disclose any research information that may identify you, even by a court subpoena, in any federal, state, or local civil, criminal, administrative, legislative, or other proceedings.

All research data that is collected will be on a password protected shared file on the RIT server, or a local file. The information will also be modified to keep each subject's data anonymous. Subjects will be given a Subject ID to identify them in the upcoming trials. We will disclose your information for any purpose to which you have consented, as described in this informed consent document. This includes age, height, weight, ball kinematics, and body kinematics. Players will also have a video taken from the back of the pitching mound, as well as the side of the mound.

There are reasons why information about you may be used or seen by the researchers or others during or after this study. Examples include:

- University, government officials, study sponsors or funders, auditors, and/or the Institutional Review Board (IRB) may need the information to make sure that the study is done in a safe and proper manner.

We will not keep your name or other information that can identify you directly.

The results of this study could be published in an article or presentation but will not include any information that would let others know who you are.

We may use or share your research information for future research studies. If we share your information with other researchers, it will be de-identified, which means that it will not contain your name or other information that can directly identify you. This research may be similar to this study or completely different. We will not ask for your additional informed consent for these studies.

9. Contact Information

Please contact the researcher listed below to:

- Obtain more information about the study
- Ask a question about the study procedures
- Report an illness, injury, or other problem (you may also need to tell your regular doctors)
- Leave the study before it is finished
- Express a concern about the study

Principal Investigator: Charles Arnold, Undergraduate Student, Student at RIT
Email: cja4221@rit.edu
Phone: 951-870-1727

Co-Investigator: William Brewer, Director of Exercise Science Program at RIT
Email: wsbscl@rit.edu
Phone: 585-370-1716

10. YOUR CONSENT

Consent/Assent to Participate in the Research Study

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. I/We will give you a copy of this document for your records and I/we will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information in Section 9 provided above.

I, the investigator, understand the process of storing data and protecting subject informed consent and subject assent. I will protect participant data and avoid the any risk prior to the investigation

I, the subject, understand what the study is about, and my questions so far have been answered. I agree to take part in this study.

Signature of Investigator: _____

Subject Name: _____

Subject Signature: _____