UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Building Biomechanics Lab in School of Kinesiology

Title

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Name of Submitter

(Faculty or Staff Only)

School of Kinesiology, College of Education and Human Development

Organization

Title:	Building Biomechanics Lab in School of Kinesiology	Date:	7/15/2024

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ABSTRACT (250 words or less):

The purpose of this grant is to purchase 2 force plates integrated with video-camera as a first step building a biomechanics lab in the School of Kinesiology. This equipment provides students with hands-on experience as they learn human biomechanics. The school of Kinesiology has approximately 1,000 students enrolled in both the undergraduate and graduate programs. These students are pursuing their careers in fitness and healthcare professions, such as athletic training, physical therapy, occupational therapy, coaching, fitness, and personal training. These students are required to learn the basic concepts of human movement in relation with sport performance, injury prevention, and rehabilitation via various classes. However, the equipment that could teach those is limited to book information and media information due to not having specific lab equipment for assessing biomechanics in human movement. The force plate is an essential piece of equipment in biomechanical assessment and is considered a gold standard to assess forces exerting on the body during various daily and sport activities. It can assess various biomechanical variables that are directly and indirectly associated with sport performance and as sports related injuries. Building a new biomechanics lab with the proposed equipment will help students better understand the concept of biomechanics, consequently, maximize their learning on human movement in relation with sport performance, and prevention and rehabilitation of sports related injuries. (**220 words**)

Purpose of grant

The purpose of this grant is to purchase 2 force plates integrated with a video-camera system (**figure 2 and 3**) and build a biomechanics lab within the adaptive and motor development room (B107-A) in the School of Kinesiology. Currently, we have approximately 1,000 students enrolled in both the undergraduate and graduate programs. Students are pursuing their careers in fitness and healthcare professions, such as personal trainer, coach, physical education teacher, athletic trainer, and physical therapist. As these professions require understanding of human biomechanics (human movement) and its effect on sports performance and injury mechanics, students are required to take courses to learn biomechanics in relation to sports performance and musculoskeletal injuries. However, students are limited to learn these concepts only in books because we do not have enough equipment. Two force plates integrated with video-camera system could visualize the concept of human biomechanics that students learn in books, therefore, it will help and enhance students' leaning of human biomechanics.

A force plate is an essential piece to analyze biomechanics in human motion, and considered a gold standard in assessing forces exerting on human bodies. Specifically, it can measure forces that go thorough extremities during various daily and sport activities, such as squatting, jumping, walking, and running. It can also measure balance, jump height, power, and work during sport related activities. These measurements can be used to evaluate athletic performance, imbalance between the limbs, and deficits following musculoskeletal injuries. This information is used to design exercise programs for better performance and rehabilitation programs for injured individuals. The force plate we currently have in the exercise physiology lab is old and was purchased as independent use, therefore, it is not designed to integrate with other equipment, such as video camera. Furthermore, its size and model limit the task to be performed, therefore it does not provide as much information needed. The integration of a force plate with a video camera enables the visualization of force vectors overlaid on the subject in motion, thereby offering real-time insights into the alignment of forces with movement patterns. This visual feedback is crucial in educational settings, facilitating the comprehension of the intricate interplay between force application and movement dynamics. Moreover, it improves research accuracy

The proposed equipment (2 force plates (AMTI)) integrated with video camera system (AccuPower Solutions) and software (AccuPower Solutions)) assesses forces from bilateral limbs with a simultaneous video recording of performance. The settings for the foece plates and fillers are presented in Figure 1. The Cameras allow capture the performance while simultaneously collect force data. The force data can be overlaid to the video image (Figure 2), which allows visualization of forces that go through human's body. A software (AccuPower Solutions) can calculate biomechanical variables (balance, jump height, power, and work) while showing these variables in a graph in real-time. This whole system can provide students with visual information of the forces and other variables. Therefore, this whole system will enhance and maximize students' learning of biomechanics. Furthermore, since the proposed equipment is a research grade with high validity and reliability, it also provides students and faculties with research opportunities.

Impact to student body as a whole

This system will have an impact on students in Health & Physical Education, Exercise Science Fitness Studies, Exercise Science Pre-Professional Studies, Pre-Athletic Training, and Master of Science in Athletic Training programs in their classroom education in KNES 415 Biomechanics, KNES 502 Measurement and Evaluation Instrumentation in Exercise Physiology, KNES 514 Research Methods,

and KNES 525 Therapeutic Rehabilitation. Students will be able to see different types of force magnitudes and vectors by jumping on, walking on, squatting on the force plate, so that they can utilize the information as they develop and implement exercise programs, injury prevention programs, and rehabilitation programs.

Projected lifetime of enhancement

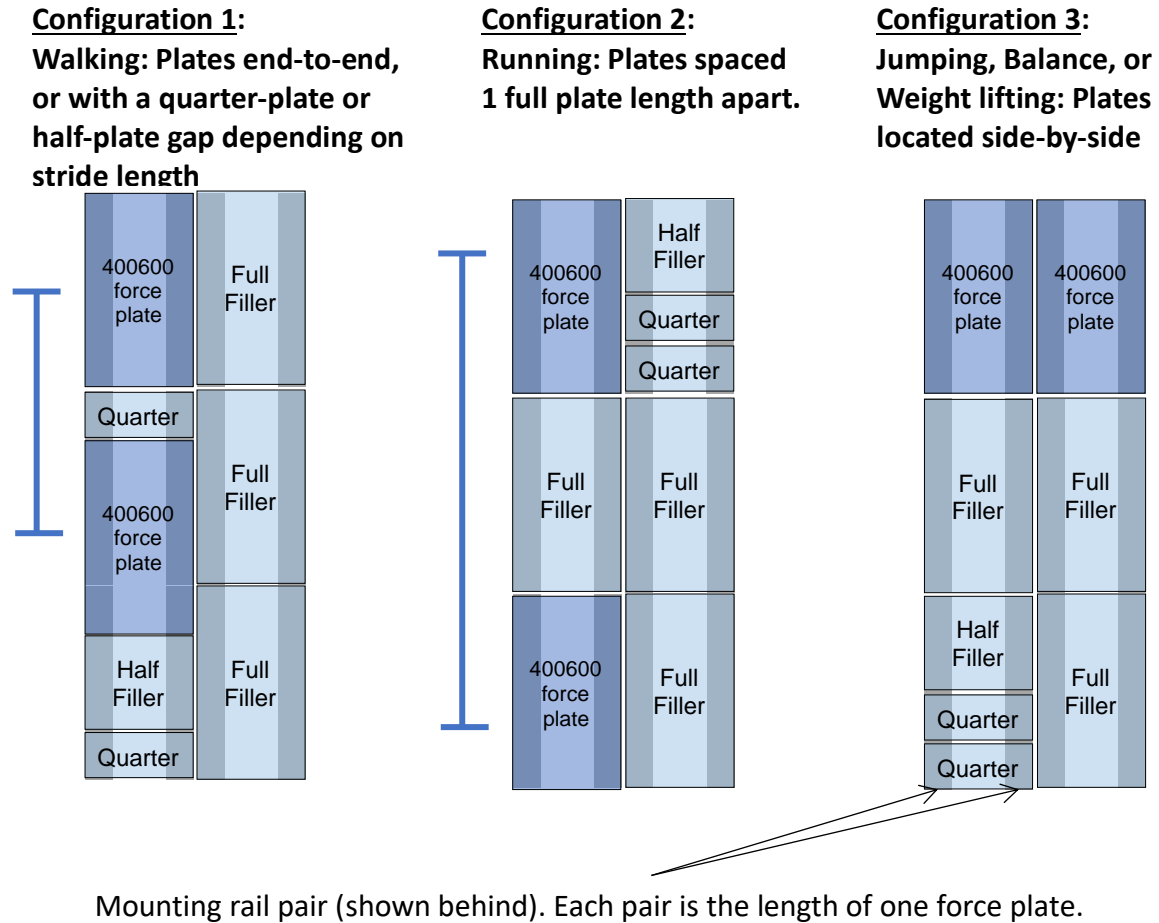   It is expected to last more than 8 years.

Person(s) responsible for installation, maintenance, and operation

       Dr. Shiho Goto will be responsible for installation, maintenance, and operation of the force plate system as well as training faculties and students. She has over 8 years' experience using the force plate system at her previous work where she was responsible for operation, maintenance, and troubleshooting. She also trained multiple people for the force plate use.
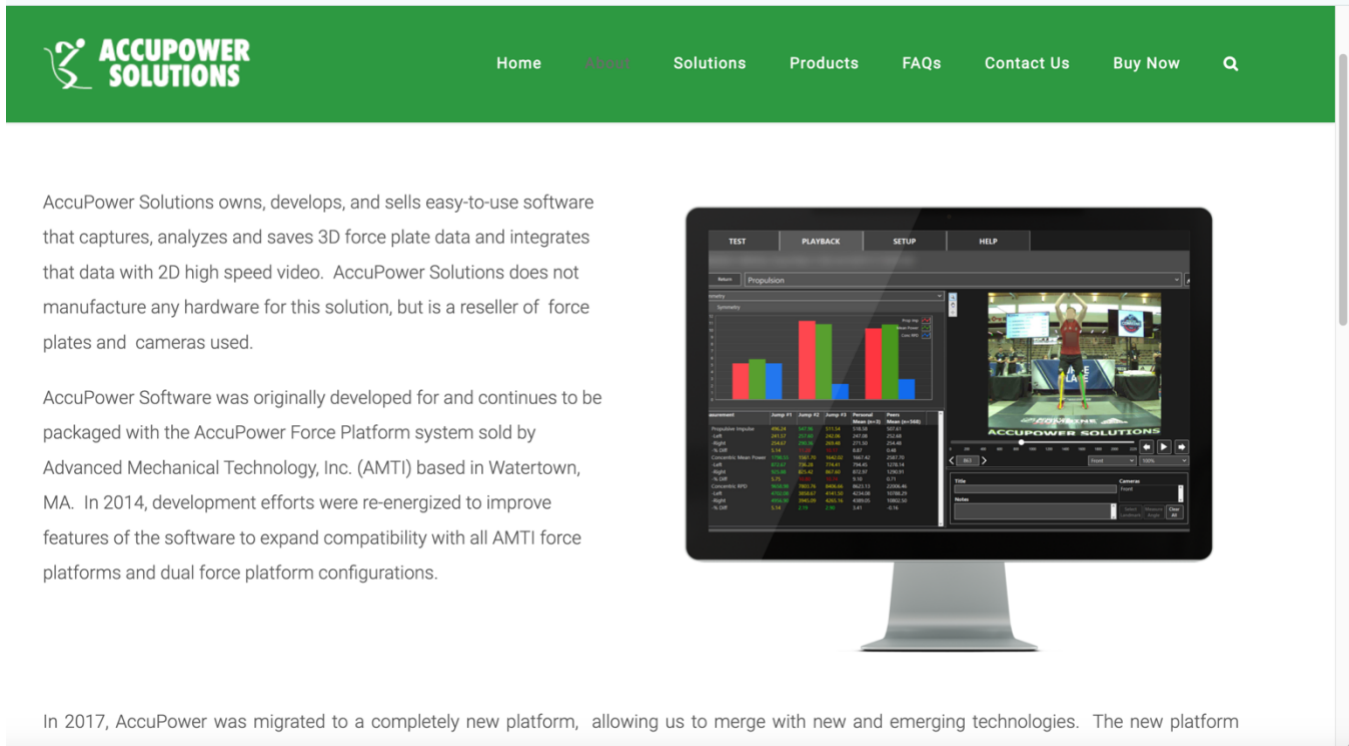
Engineer from AMTI will install the force plate and engineer from Accupower will install the software and perform demonstration. Dr. Goto will train faculties who will potentially use the force plate for their classes. She will also train graduate and undergraduate students who are interested in research project using the force plates.

Proposed Equipment Setting
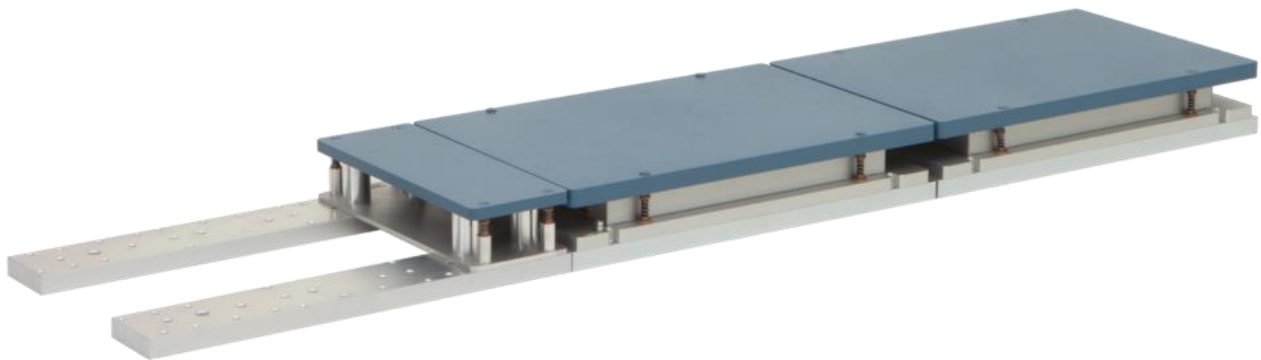
Figure 1. Force plate and fillers (AMTI)

Configuration 1:
Walking: Plates end-to-end, or with a quarter-plate or half-plate gap depending on stride length

Configuration 2:
Running: Plates spaced 1 full plate length apart.

Configuration 3:
Jumping, Balance, or Weight lifting: Plates located side-by-side

Configuration 1:
- 400600 force plate | Full Filler
- Quarter
- 400600 force plate | Full Filler
- Half Filler | Full Filler
- Quarter

Configuration 2:
- 400600 force plate | Half Filler
- | Quarter
- | Quarter
- Full Filler | Full Filler
- 400600 force plate | Full Filler

Configuration 3:
- 400600 force plate | 400600 force plate
- Full Filler | Full Filler
- Half Filler | Full Filler
- Quarter
- Quarter

Mounting rail pair (shown behind). Each pair is the length of one force plate.

Figure2. AccuPower Solution (Software to analyze data, Video system):

Figure 3. AMTI Force Plate with filler and rails

Budget Proposal
(Please see the attached Quote for details)

1. **Equipment**   **$ 41880 (AMTI -2 force plates, Fillers, and Rails)**
                       $ 3900 (AccuPower Basler Ace Camera Video System)

2. **Software**   **$ 3500 (Accupower – listed in the Quote from AMTI)**

3. **Supplies**   **$**

4. **Maintenance**   **$ 500 x 5 (License for 5 years)**

5. **Personnel**   **$ 7000 (installation – AMTI force plate)**
                       $ 3000 (installation & demonstration AccuPower)

6. **Other**   **$ Shipping TBA (estimated -$1000)**

TOTAL: **$ 62780**