



July 1, 2022

The Japan Society of Mechanical Engineers
Hokkaido Branch
“Biomechanics Research Meeting”
39th Seminar

Chairman: Toshiro Ohashi

The Biomechanics Research Meeting will sponsor presentations, inviting Profs. Batbayar Khuyagbaatar and Danaa Ganbat from Mongolian University of Science and Technology (MUST), Mongolia. Faculty members, graduate students, and undergraduates are encouraged to participate in the seminar.

Date&Time: July 21, 2022, 10:00 - 11:30

Place: Room A1-17, Faculty of Engineering, Hokkaido University

10:00 - 10:15

「Finite element analysis on clinical treatment methods for sacroiliac joint dysfunction」
Ryota Toyohara, Division of Human Mechanical Systems and Design, Hokkaido University, Japan

Abstract:

Sacroiliac joint dysfunctions (SIJDs) are considered to account for 15-30% of patients with low back pain. The sacroiliac joint (SIJ) is located between the sacrum and the ilium and works as a shock absorber that receives the impact of the trunk and lower limbs. An unexpected force and/or repeated impacts are hypothesized to cause joint misalignment and instability and to occur pain arising from the SIJ. A lot of treatment options have been suggested, however, objective evaluation has not been sufficiently performed. We thus look into how various treatment procedures are affected. In this talk, we will introduce finite element analysis on two types of SIJD treatments: pelvic belts and joint fixation. Both treatment methods are intended to fix SIJs, and the results supported this. Finite element analysis visualizes the treatment effect and clarifies the mechanism.

10:15 - 10:30

「Detection of filopodia to identify leader cells in migration by image analysis」
Baasansuren Otgon, Division of Human Mechanical Systems and Design, Hokkaido University, Japan

Abstract:

Collective cell migration has a crucial role during wound healing, angiogenesis and cancer metastasis. Studies have highlighted one kind of cell, named leader cells, forms at the leading edge and regulates collective migration in recent years. Therefore, the identification of leader cells using modern advanced technology is vital in the metastasis of cancer cells and the treatment of cancer.

10:30 - 11:00

「Kinematic comparison of weightlifting techniques using IMU sensors」

Prof. Batbayar Khuyagbaatar, Biomechanical Research Laboratory, Mongolian University of Science and Technology (MUST), Mongolia

Abstract:

Weightlifting performance is strongly dependent on technique, explosive strength, and flexibility. There are two major lifts involved in competition: the snatch and the clean and jerk, and the snatch is the most technical component of the weightlifting competition. Most technical analyses have previously been performed using either video analysis or conventional optical camera systems. In this study, we investigated the joint kinematics of the trunk, shoulder, elbow, hip, and knee as well as the main phases during the snatch technique for Mongolian national and college level weightlifters using multiple IMU sensors. Seven female Mongolian weightlifters (three national level and four college level) participated. Each participant performed three snatch attempts at 70% of their one-repetition maximum. The joint angles were calculated using three-axis acceleration and three-axis gyroscope data from the IMU sensors. The six main phases of the snatch technique were defined based on knee flexion. All parameters were compared between the national and college level weightlifters. This study provides a kinematic difference between the two different level weightlifters, which may help coaches and athletes to improve their training strategy and weightlifting performance.

11:00 - 11:30

「Normal range of motion of the hip, knee, and ankle joints in Mongolian people」

Prof. Danaa Ganbat, Biomechanical Research Laboratory, Mongolian University of Science and Technology (MUST), Mongolia

Abstract:

It is important to identify the normal range of motion (ROM) of the human joints for both biomechanical and clinical applications. For health care providers, including physicians and therapists, the restoration of normal ROM is a difficult task. The severity of impaired joint mobility or the postoperative rehabilitation process must be evaluated in comparison with a normal reference value. However, there are no studies that have reported the ROM of Mongolian subjects. In this study, we measured the hip, knee, and ankle joint angles using multiple wearable inertial sensors. 10 healthy young subjects participated. The three-dimensional (3D) motion data were collected while the subject were walking at normal speed. In our knowledge, this study is the first to analyze the normal ROM of Mongolian male subjects. The collected data can be used as reference values for evaluating the disability of the motion and performance in rehabilitation programs.

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