Personal Statement
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Advancement of technology and computational power and speed has enabled data collection of human movement with high accuracy and precision. Human motion analysis becomes a common tool in biomechanics and rehabilitation research. However, the application of human motion analysis is still limited due to its complexity, soft tissue artifacts, generation of massive high-dimensional data, lack of normative data, and knowledge gap between findings of motion analysis and clinical issues. From a single joint motion to whole body movement, we are no longer satisfied with quantitative measurement of major joint angles. In order to better understand causes of injuries/disease, we look for detailed coupled motions of a joint with high accuracy and precision. In order to advance Biomechanics in this specific area, I recommend interdisciplinary biomechanics research to enhance the understanding of the broad array of human movement disorders.

- ***Medical data-based integrated research***

Currently massive medical data is collected and stored including medical images, videos, questionnaires and forms, and etc. Unfortunately modern medical data is often not connected and hard to navigate due to the massive, multimodal and high-dimensional features. Biomechanical research integrated with medical data may lead us to new knowledge discoveries.

- ***Patient-specific modeling and visualization***

Medical imaging (x-ray, MRI, CT etc) is often used for diagnosis of injuries/diseases. Reusing medical images for patient-specific models and integrating these models with motion analysis will enable us to better visualize biomechanical findings of human movement disorders.

- ***Computer modeling and simulation***

Computer modeling and simulation is a powerful tool for biomechanics research. However, clinical application of computer modeling and simulation is still limited. Using modeling and simulation approaches in biomechanics and rehabilitation research will improve our understanding of human movement disorders, functional evaluation of medical treatments, and predict clinical outcomes prior to surgical and nonsurgical interventions.

- ***Better statistical analysis approaches***

Findings of biomechanics and rehabilitation research often involve massive high-dimensional data. Comparing massive high-dimensional data between patient groups and healthy controls is often challenging. Many between-subjects variables, such as gender, height, weight and etc, make comparisons more difficult. Often many variables, such as peak values and timings when the peak occurs, are created for statistical analysis when comparing two motion patterns (4D data, 3D space plus time). Better statistical analysis approaches are needed to compare high-dimensional data between groups.

In summary, I believe the multidisciplinary research approach to biomechanics and rehabilitation research will provide evidence of the merit of motion analysis in the clinical arena. Better visualization from patient-specific models and prediction from modeling and simulation will enhance communications between patients and clinicians, assist in clinical decision-making, and improve clinical outcomes. Utilizing existing massive medical data in motion analysis research will facilitate new knowledge discoveries of human movement disorders. Object-oriented statistical analysis of motion patterns before and after interventions will deliver more meaningful comparison between patient groups and healthy controls. The Biomechanics Priorities Conference will facilitate trans-domain and interdisciplinary discussions and recommendations on biomechanics and rehabilitation research. I look forward to the opportunity to participate in this important meeting.