

## INTRODUCTION

- Neuromuscular patterns play an important role in the pathophysiology of ACL injury.
- However, common return to play assessments after ACL reconstruction focus on symmetry to the contralateral leg, rather than quality of movement.
- Traditional camera-based motion analysis is expensive and labor-intensive making it difficult to apply in a clinical setting.
- New inertial measurement unit (IMU) based motion analysis systems offer great promise as a more efficient and clinically useful tool in neuromuscular evaluation of the athlete that is portable and camera-less.

## PURPOSE

The purpose of the current study was to establish the variability in lower extremity kinematics in healthy adolescent athletes using an IMU-based motion analysis system

## METHODS

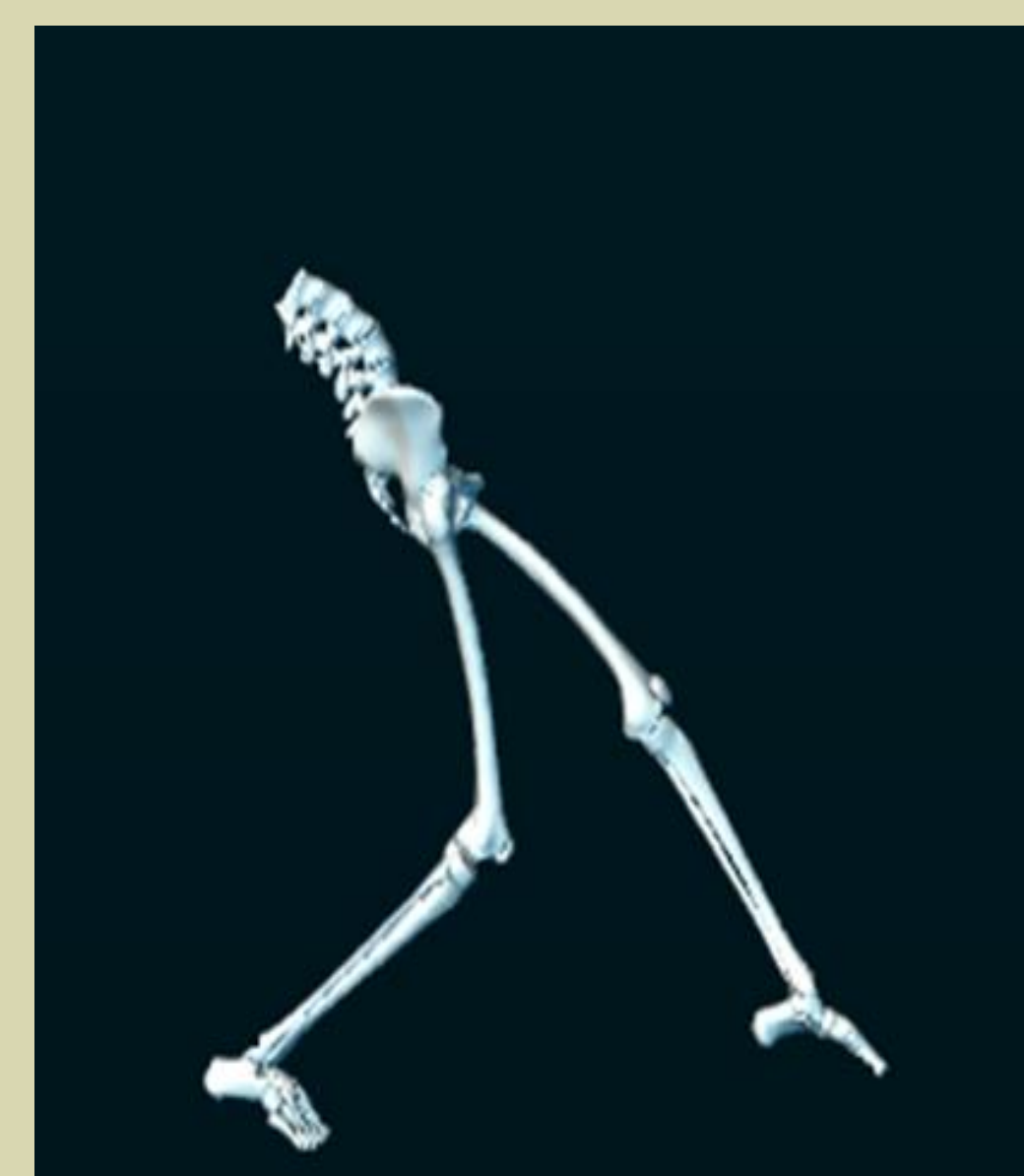
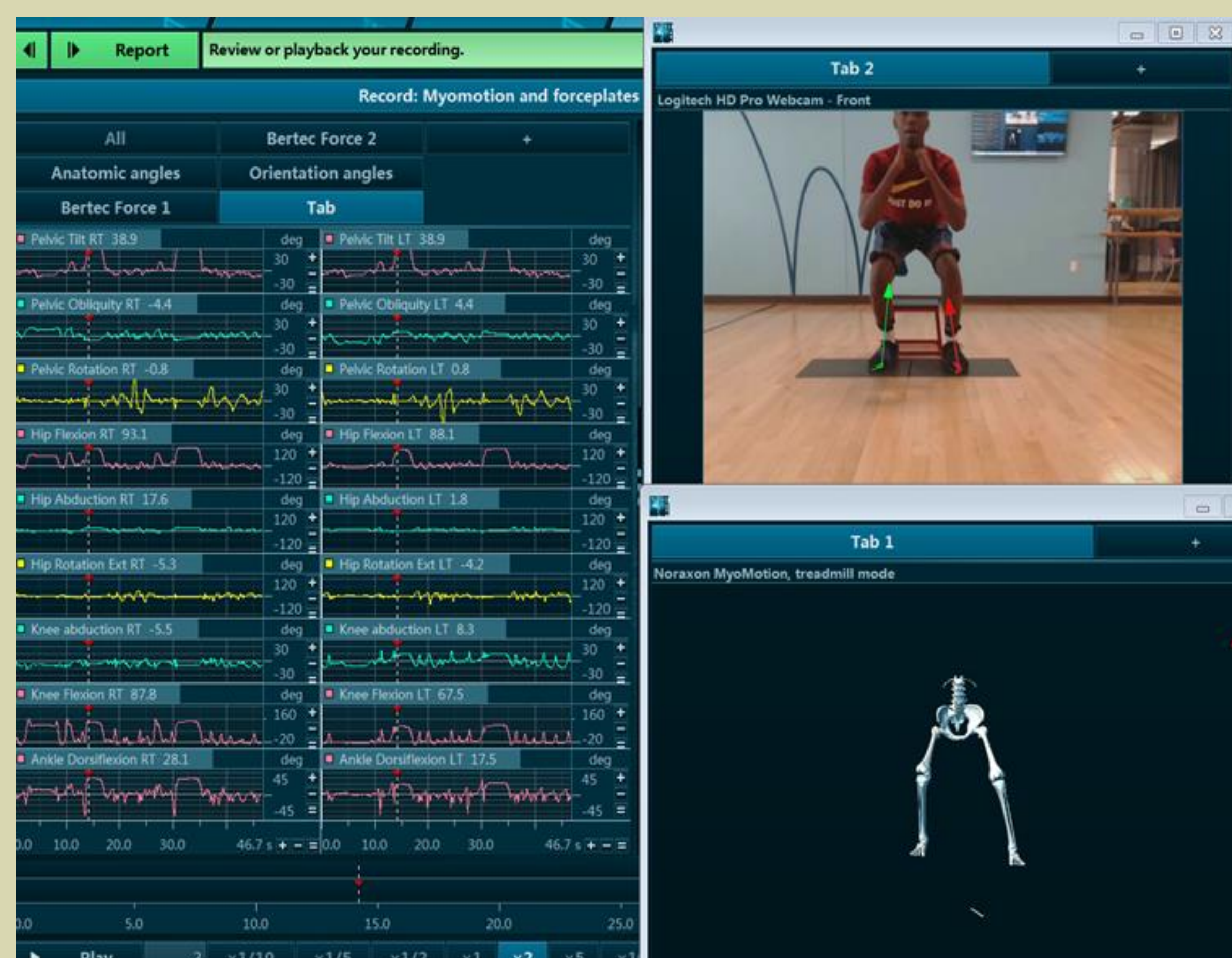
- A prospective cohort study of 47 healthy athletes aged 12 to 16 years was performed. All athletes were free of current injury and participated in a variety of sports.
- The **Noraxon** Myomotion IMU-based motion analysis system was utilized to characterize comprehensive lower extremity kinematics using 8 sensors at a time.
- All athletes performed two trials of the (1) anterior reach portion of Y-balance (single leg squat), (2) drop vertical jump, and (3) single leg hop,
- The patient cohort included 12-13 year old boys (n=9), 14-16 yo boys (n=8), 12-13 yo girls (n=18), and 14-16 yo girls (n=12).
- The dominant and non-dominant extremity were analyzed separately.

## RESULTS

- Variability and differences between groups were largest for the **drop vertical jump** motion analysis.
- Significant differences (difference dominant/non-dominant difference, p value) were present between male and female athletes in dominant and non-dominant extremities for **drop vertical jump**
  - Hip flexion initial contact (10.1 and 12.0°, p=0.023/0.011)
  - Hip flexion final contact (18.0 and 18.9°, p=0.016/0.023)
  - Hip internal rotation initial contact (6.3 and 5.5°, p=0.004/0.006)
  - Hip internal rotation final contact (10.0 and 15.6°, p=0.026/0.004)
- Significant differences between males and females with **single leg squat for anterior reach** were present in the non-dominant leg for hip flexion (12.8°, p=0.037) and hip adduction (7.2°, p=0.019). A trend towards a nonsignificant difference was present between the older and younger subgroups for initial contact hip flexion (7.9° and 8.0°, p 0.070/0.092).

## CONCLUSIONS

- The current study demonstrates large variability in the kinematics of single leg hop, single leg squat, and drop vertical jump in healthy male and female adolescent athletes.
- The current study also demonstrates the ability of an IMU-based motion analysis system to demonstrate kinematics in the adolescent athlete and identified significant differences between male and female adolescents for multiple tasks.



Y BALANCE



DROP VERTICAL JUMP



SINGLE LEG HOP