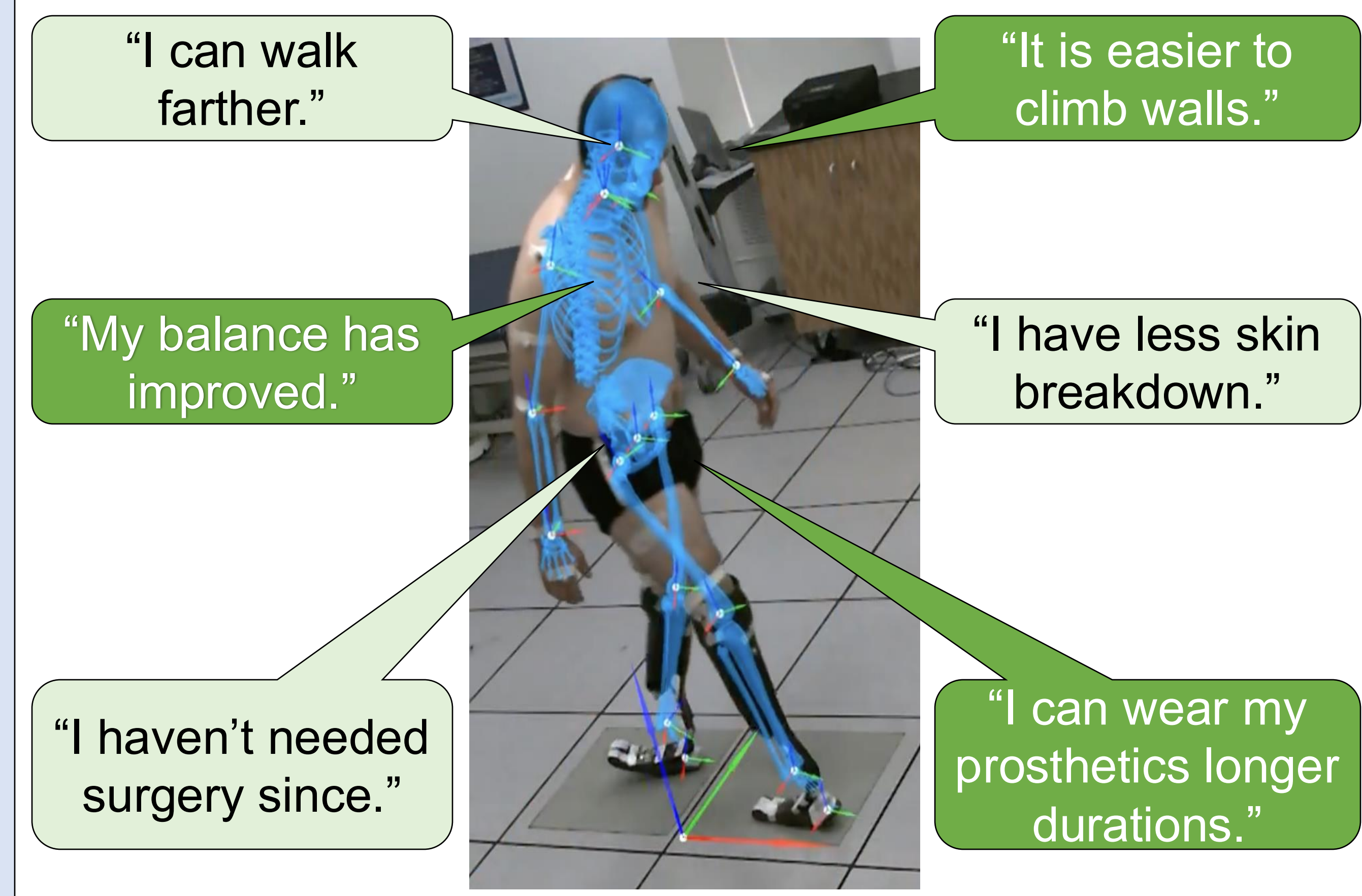


Case Description

- 32-year-old male bilateral transtibial (TT) amputee since infancy after lawnmower accident.
- Has been wearing prosthetic feet since time of injury.
- K4 triathlete whose interests include practicing jujitsu, hiking, horseback riding, and rock climbing.
- Discovered that wearing prosthetics with retroverted feet improved his gait and physical performance; has done so since 2019.
- Currently wears his prostheses more than 12 hours/day.

Patient Observations

Figure 1: Patient-reported improvements with retroverted prosthetic feet



Objective: To determine whether retroverted prosthetic feet reveal biomechanical improvements during gait compared with traditional anteverted prosthetic feet.

Methods

Table 1: Prosthetic components

Variable	Anteverted Feet	Same (=) Different (≠)	Retroverted Feet
Model	Ossur Reflex Shock	≠	Ossur Cheetah Xplore
Suspension	Pin/Suction	=	Pin/Suction
Stiffness	Category 9	=	Category 9
Weight (kg)	1.08	≠	0.65
Socket	TSB with supra-patellar control	=	TSB with supra-patellar control
Liner	Ossur 3 mm, size 25 TT locking seal in	=	Ossur 3 mm, size 25 TT locking seal in
Shank	Vertical Shock Pylon	≠	Carbon
Foot	K4 Dynamic Foot	=	K4 Dynamic Foot

TSB = Total Surface Bearing

Methods (continued)

Figure 2: Patient standing with anteverted and retroverted feet

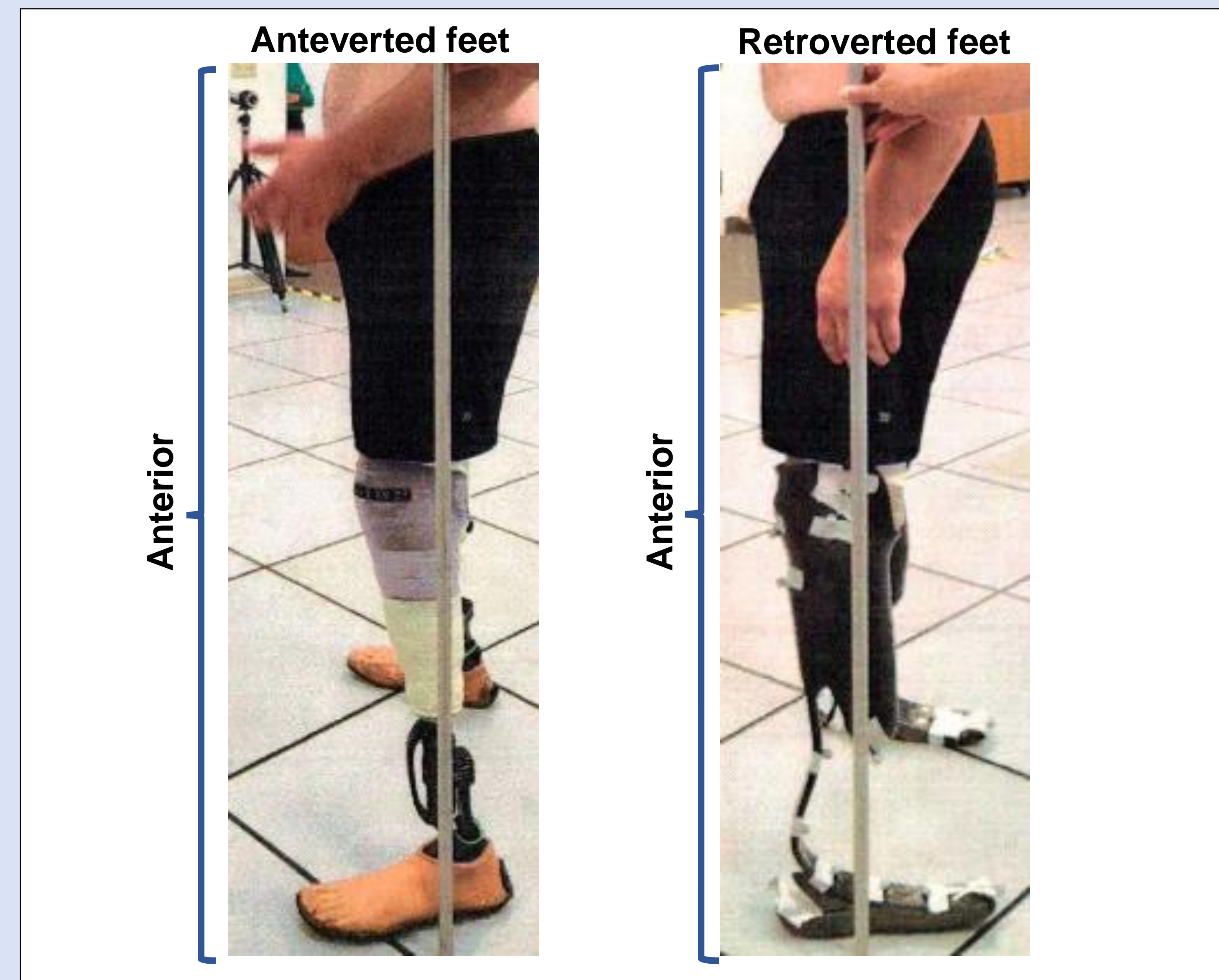
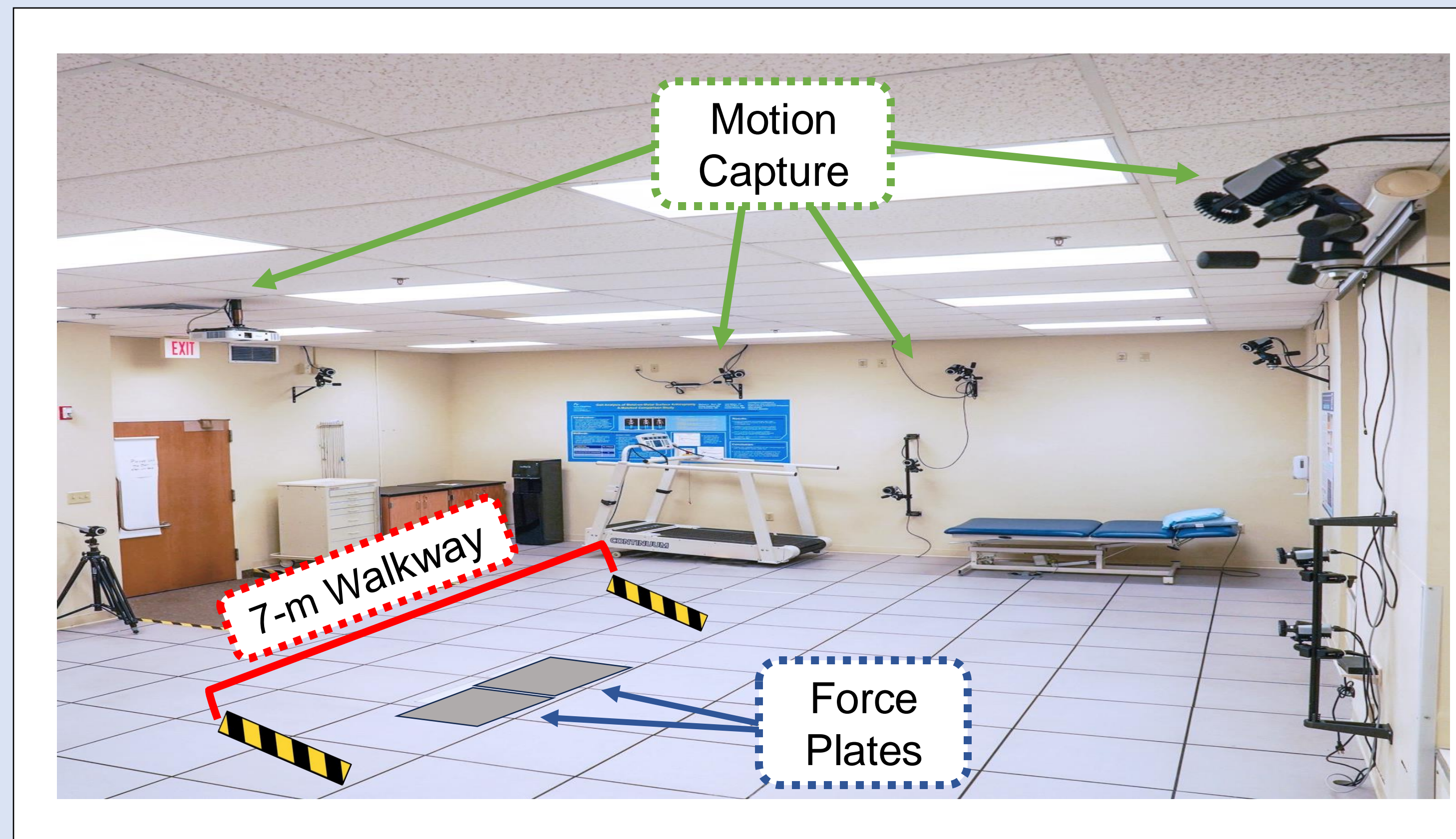


Figure 3: Motion capture gait lab at the Rehabilitation Institute



- Five overground walking trials with each prosthesis alignment
- Collection software: *Qualysis Track Manager*
- Preprocessing: *Theia3D* markerless data
- Analysis: *Visual 3D* > Kinetics/Kinematics graphs

Results: Gait Analysis

Table 2: Patient velocity and step length for each prosthetic foot

	Anteverted feet	Retroverted feet
Velocity (m/s)	1.14	1.17
Step length (m)	0.60 (L) / 0.63 (R)	0.62 (L) / 0.62 (R)

Results: Gait Analysis (continued)

Figure 4: Knee flexion and extension moment during gait

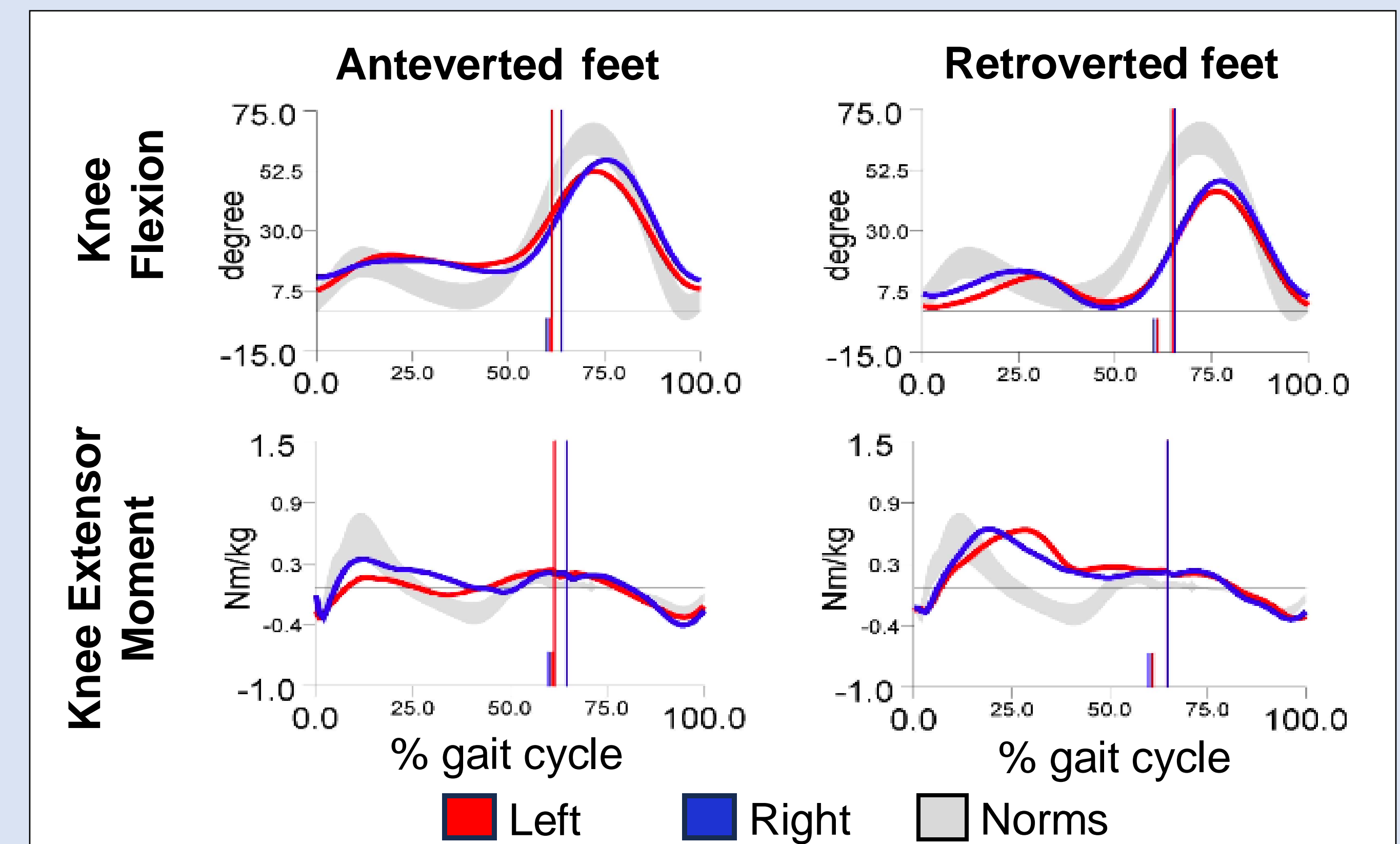
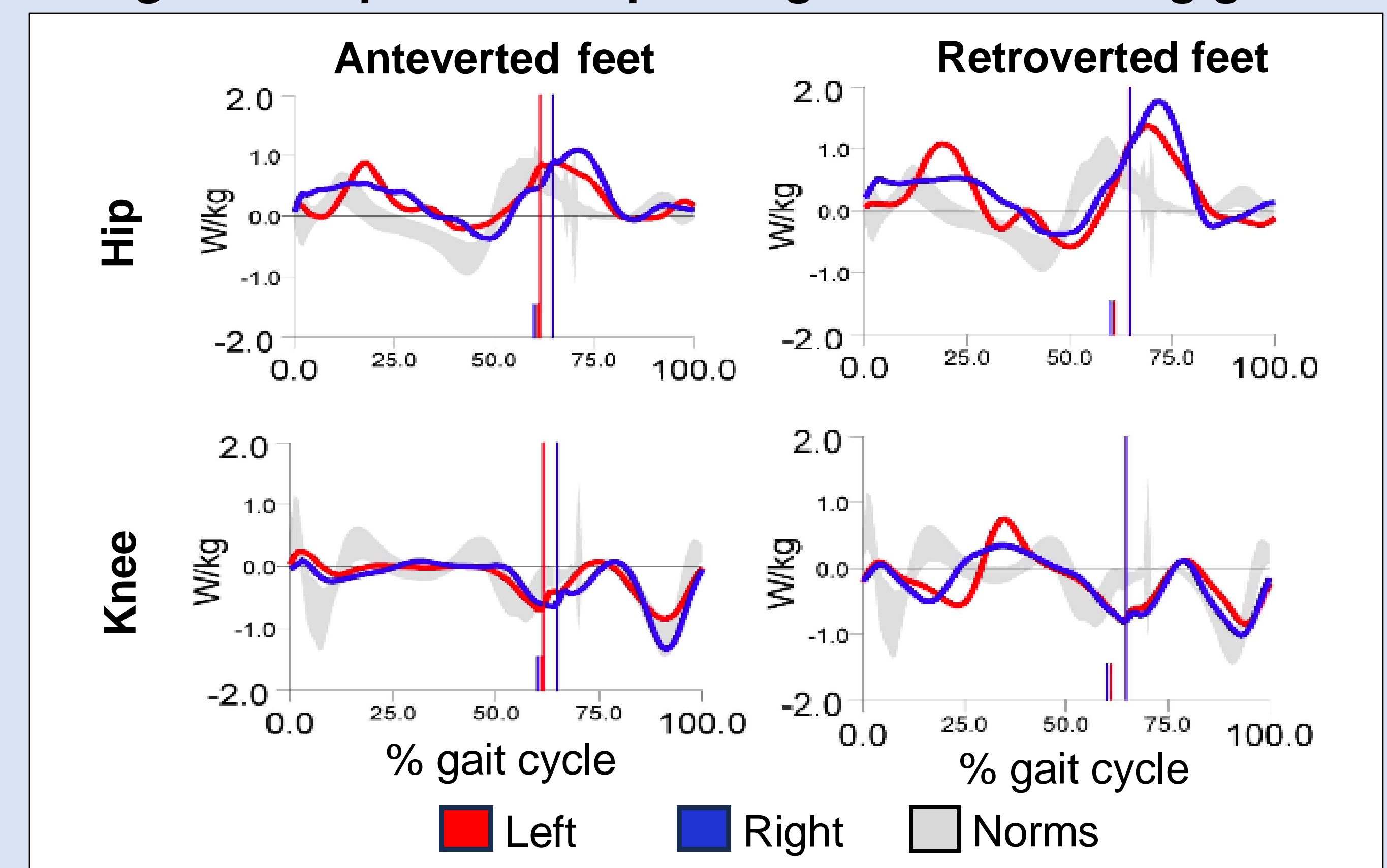


Figure 5: Hip and knee power generation during gait



Discussion

- There was less knee flexion and greater knee extension with retroverted feet compared to anteverted alignment and to normal values.
- Greater power generation was observed at the hip and knee with retroverted feet.
- These findings suggest the patient's observations may be due to enhanced stability and reduced energy expenditure with retroverted prosthesis wear.

Key Point: The patient's improved gait with retroverted prosthetic feet in this case study challenges traditional paradigms of prosthetic alignment, positioning, and design.