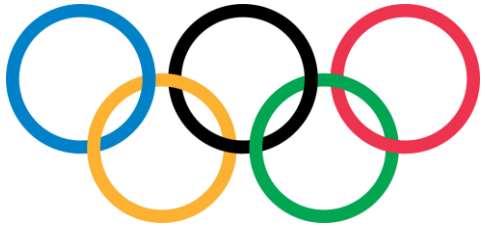
Snowboard pour personnes amputées au dessus du genou

Snowboard et prothèses

Sport jeune (Jo de Nagano 1998)



Sport Paralympique depuis 2014

- **SB-LL1 for athletes with significant impairment to one leg, such as amputation above the knee, or "a significant combined impairment in two legs", affecting their balance, their board-control and their ability to navigate uneven terrain.**
- **SB-LL2 for athletes with impairment to one or both legs "with less activity limitation", such as below-knee amputation.**
- **SB-UL for athletes upper limb impairments, affecting balance. There were no events for female athletes in the category SB-UL in the 2018 games.**

ANICES

Arts et Métiers Sciences et Technologies

Prothèses pour le snowboard

ottobock.

BIODAPT
PERFORMANCE PROSTHETICS AND ADAPTIVE EQUIPMENT

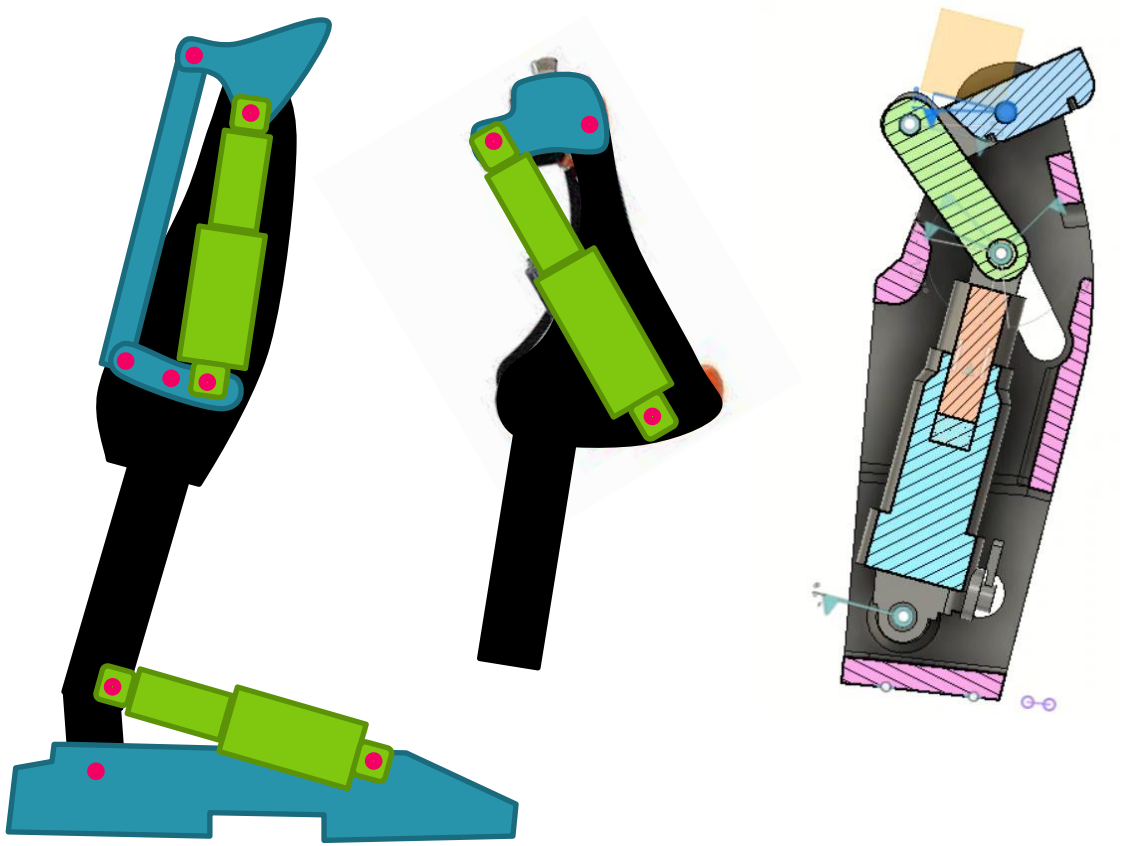
PROTEOR

Patrice Barattero

https://twitter.com/MonsterMike5

Eric Dargent

How It Works



https://foxacademy.ridefox.com/2020/08/how-shocks-work/

Biomécanique du Snowboard

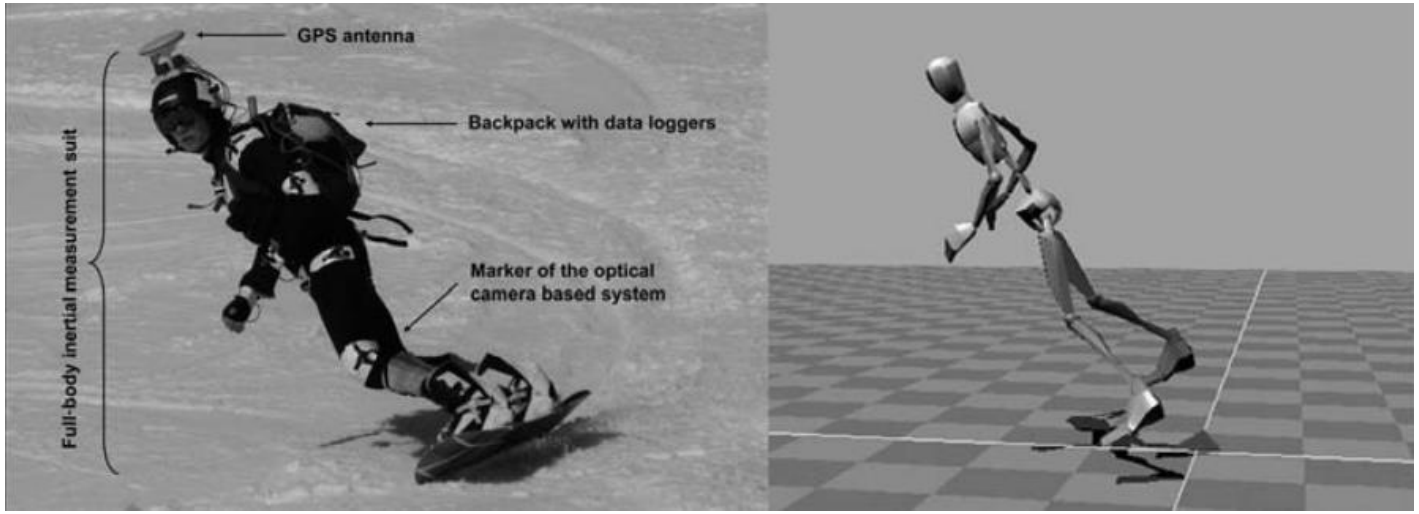
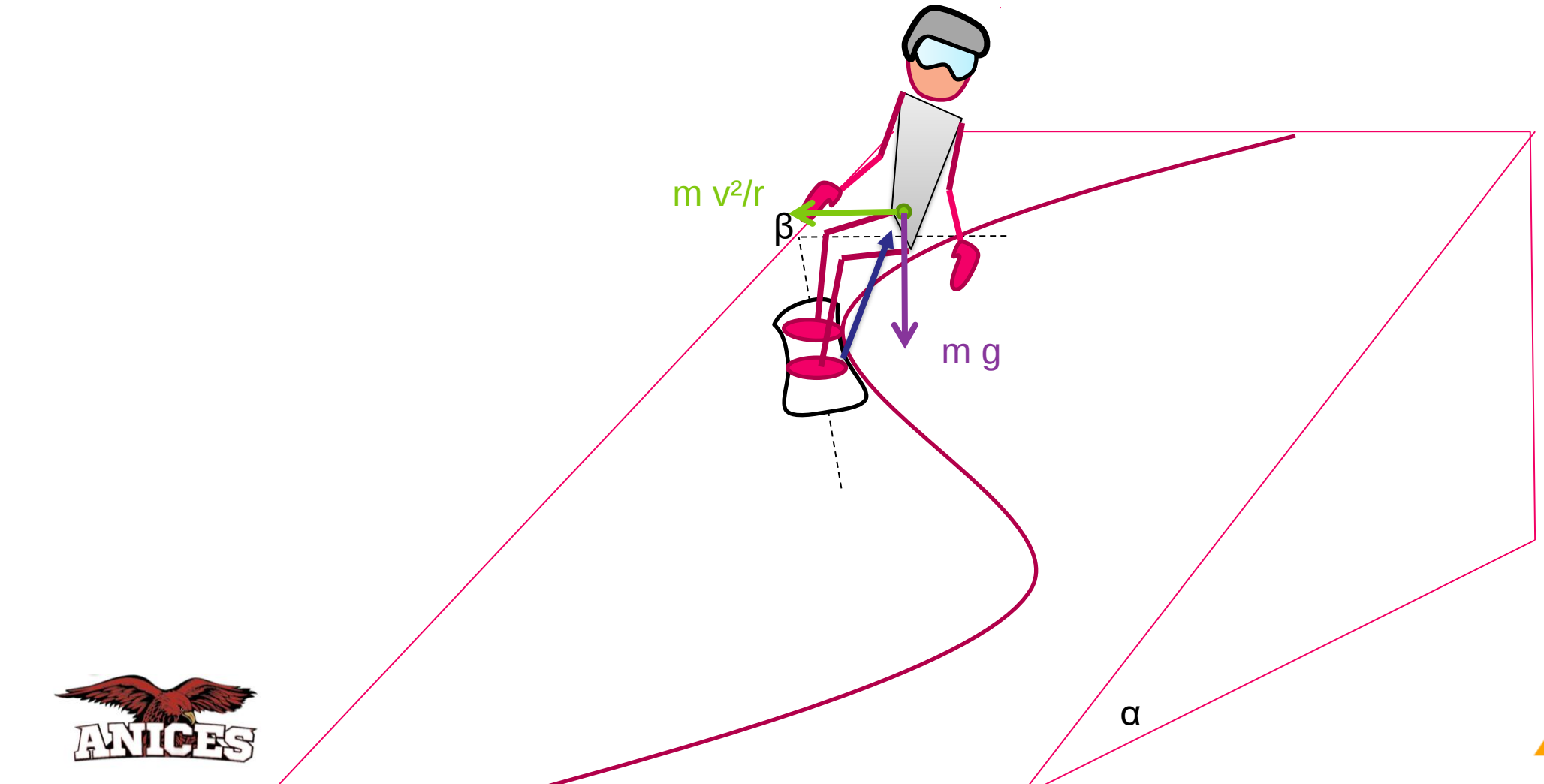


Figure 2. Entire force measurement system mounted on the test snowboard including two force plates, data logger, bridge amplifier unit, connector box, battery pack and backpack.

KRÜGER, ANDREAS; MCALPINE, PAUL; BORRANI, FABIO; EDELMANN-NUSSER, JÜRGEN Determination of three-dimensional joint loading within the lower extremities in snowboarding,

Actions mécaniques



Equilibre, inclinaison et adaptation posturale

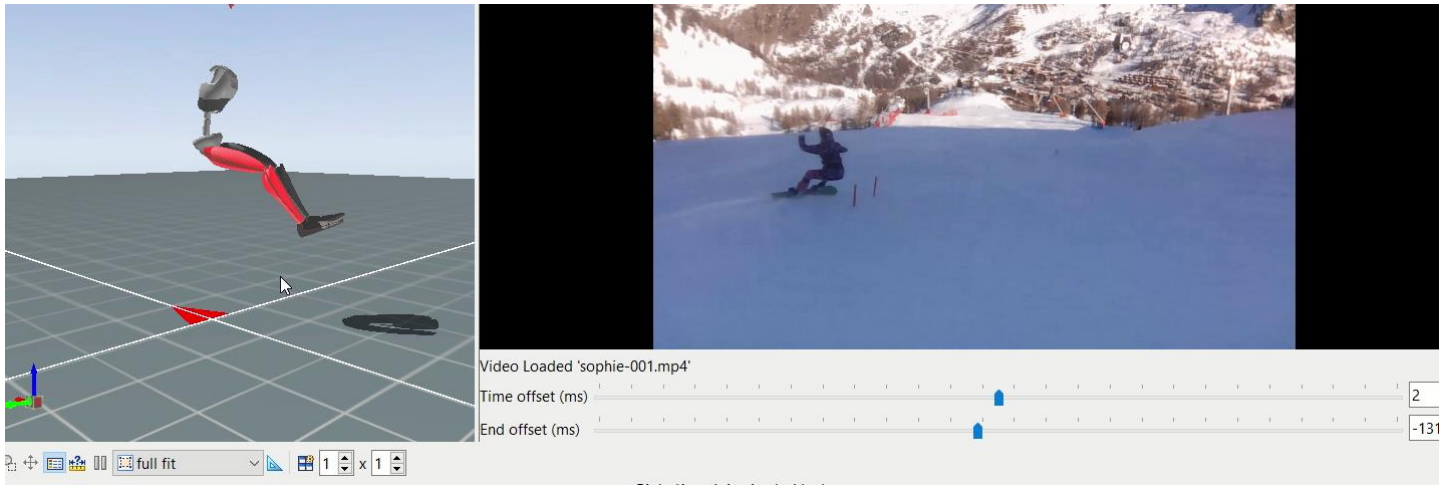
$$\tan\theta = \frac{g\cos\alpha}{g\sin\alpha\cos\beta + \frac{v^2}{R_T}}$$

Matériel et méthodes

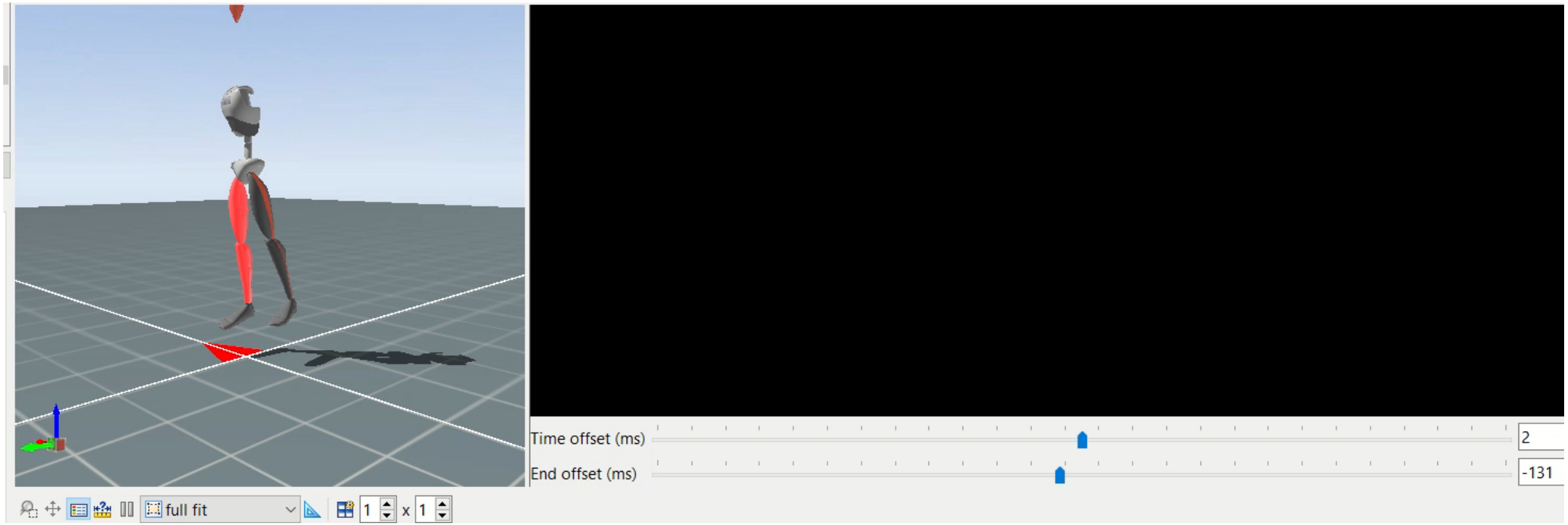
Stage ANICES

- Slalom 30 virages (15 back, 15 front)
- 4 sujets (UL, LL1, LL2)
- 8 IMU Xsens (Lower Limb + Pelvis & Trunk)
- Calibration dynamique (sans planche)

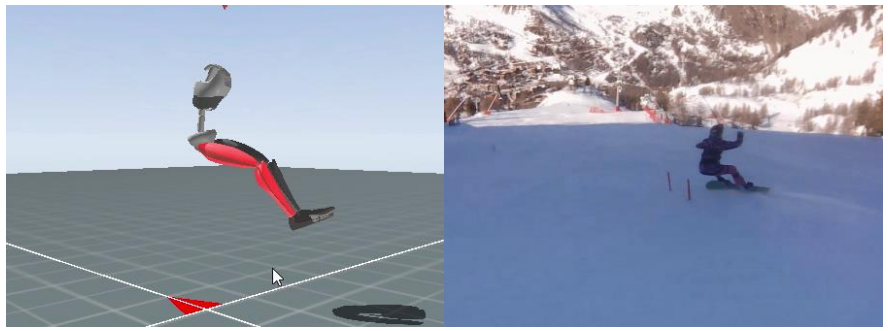
Cinématique ?

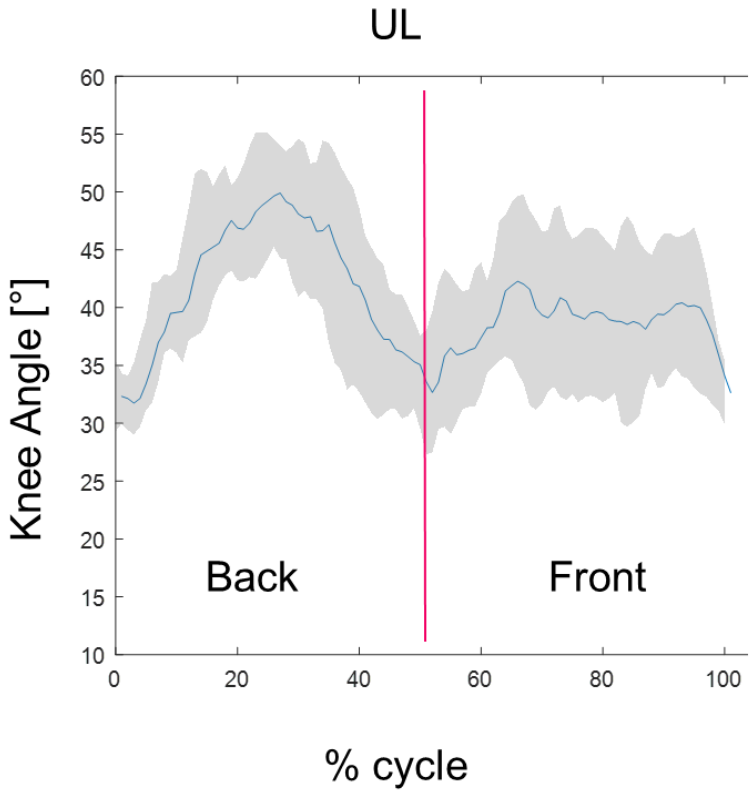


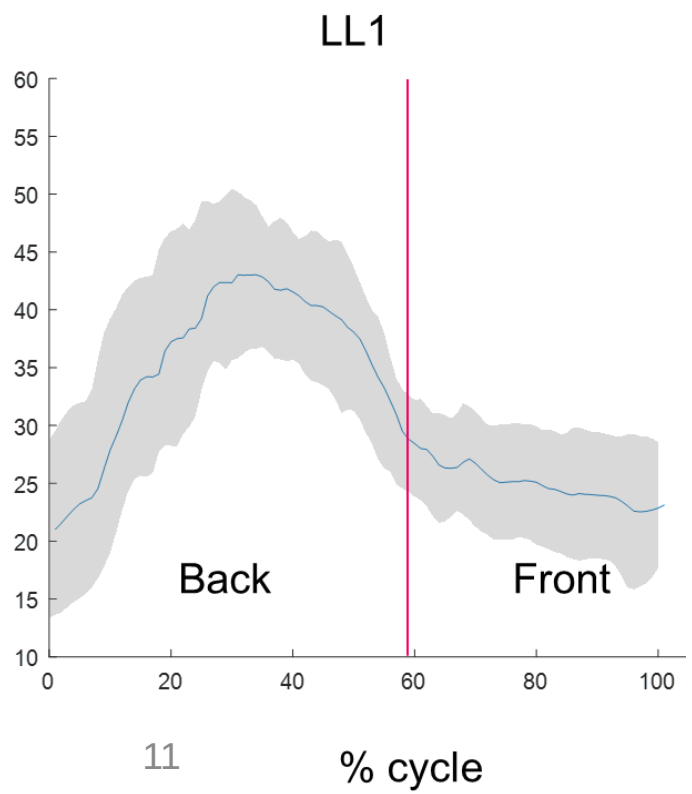
Résultats



Cinématique du genou







Force et flexion du genou

Conclusion

Cinématique

- Dorsiflexion de cheville « normale en virage front »
- Insuffisante pour permettre la flexion de genou
- Virage back, flexion de genou trop importante?
- Résistance trop faible dans les premiers degrés en back?

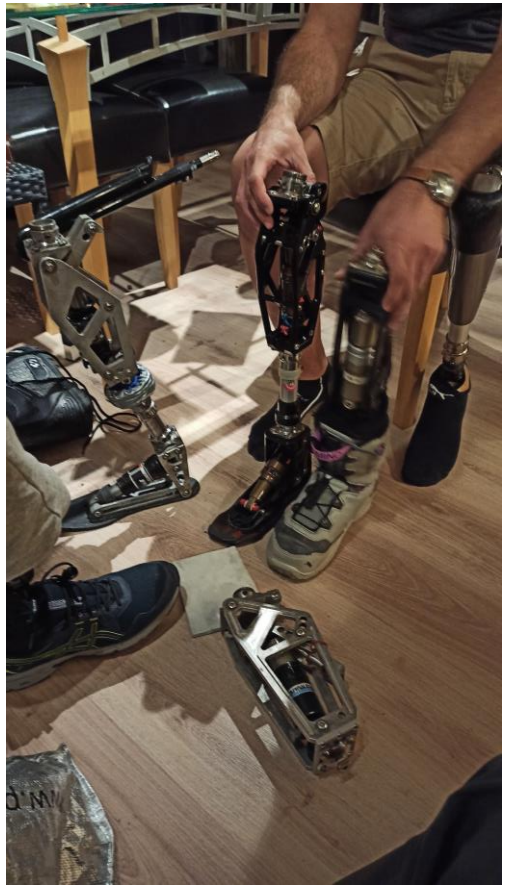
Limites :

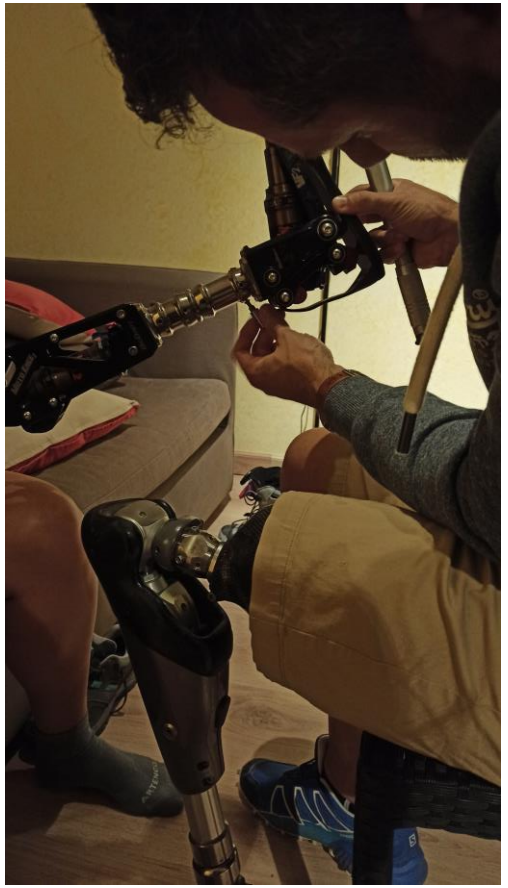
- Nombre de sujets / tests limités
- Mesure des efforts nécessaire pour équilibre avant arrière
- Calibration nécessaire en haut de chaque descente

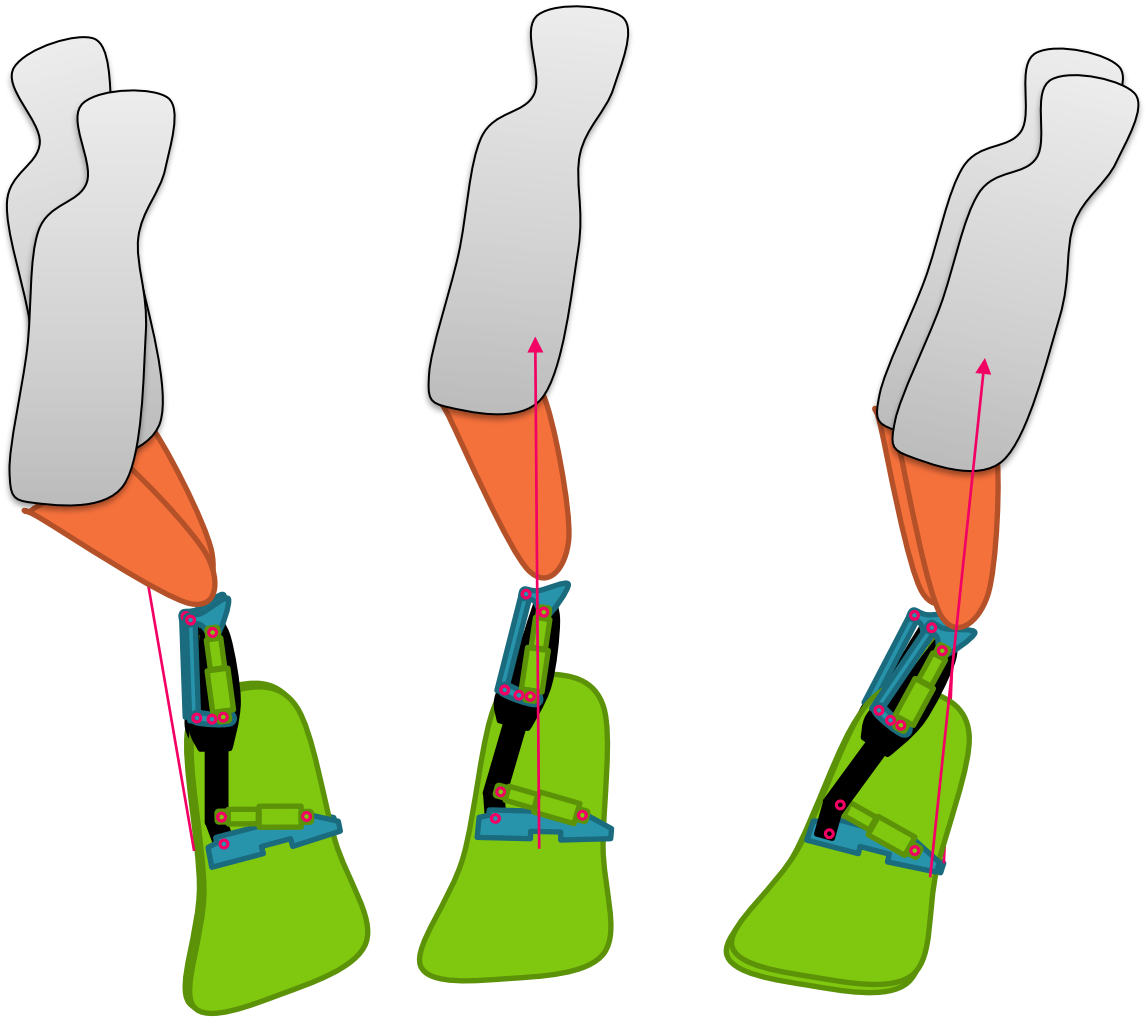
Perspectives :

- Caractériser le comportement des composants prothétiques seuls
- Reproduire en laboratoire la situation?
- Pour quantifier l'effet des réglages, alignement, évolution des composants?

Merci de votre attention



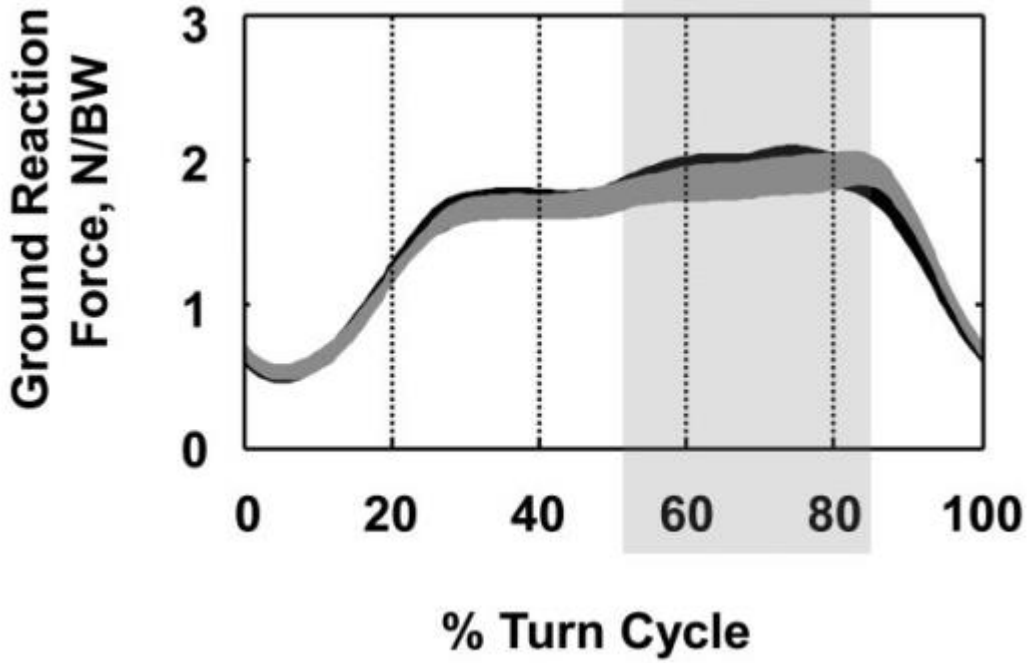


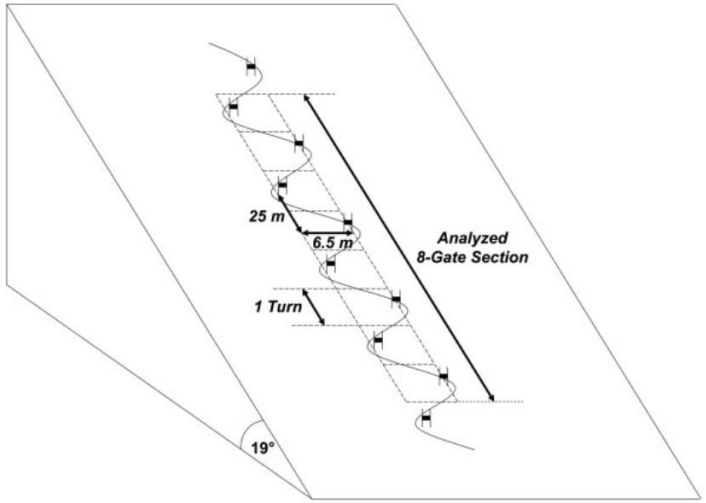


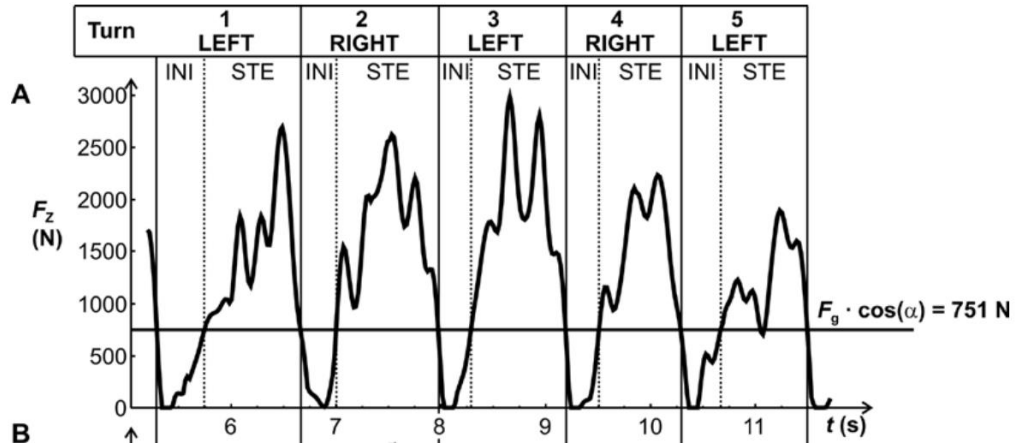
Equilibre, inclinaison et adaptation posturale

$$\tan\theta = \frac{g\cos\alpha}{g\sin\alpha\cos\beta + \frac{v^2}{R_T}}$$

Nécessité de la décharge pour le changement de carre





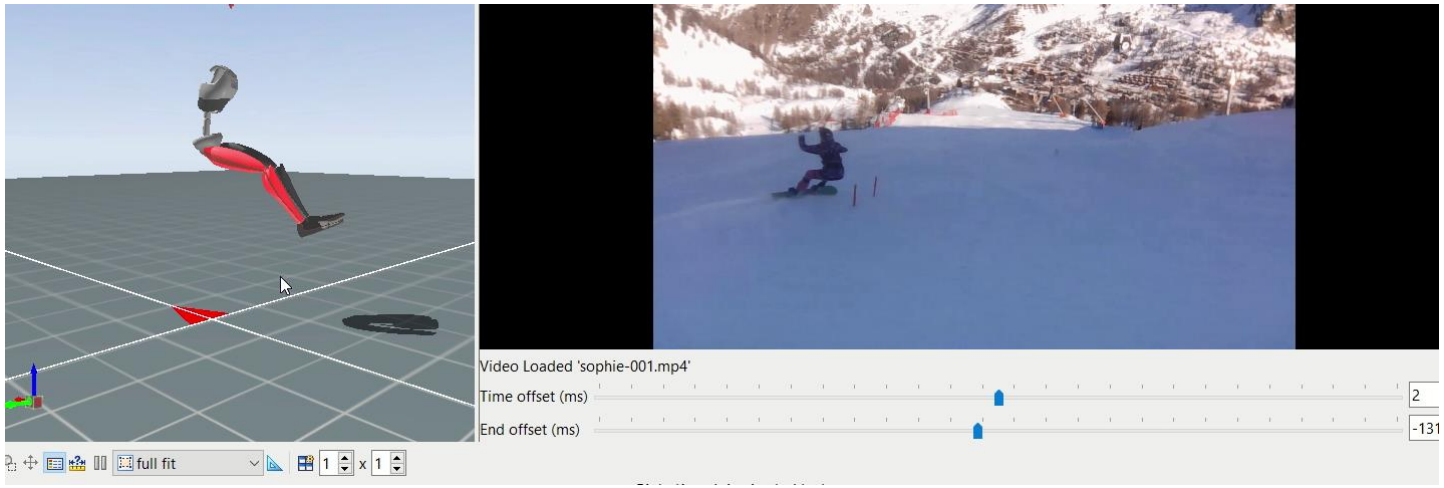


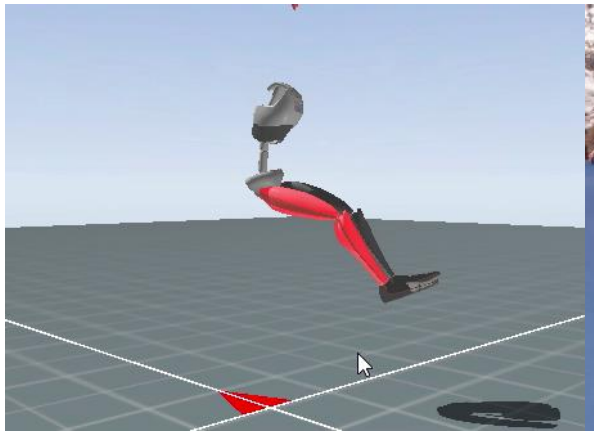
=> Flexion et Extension pendant le virage

Matériel et Méthodes

Stage de perfectionnement Anices

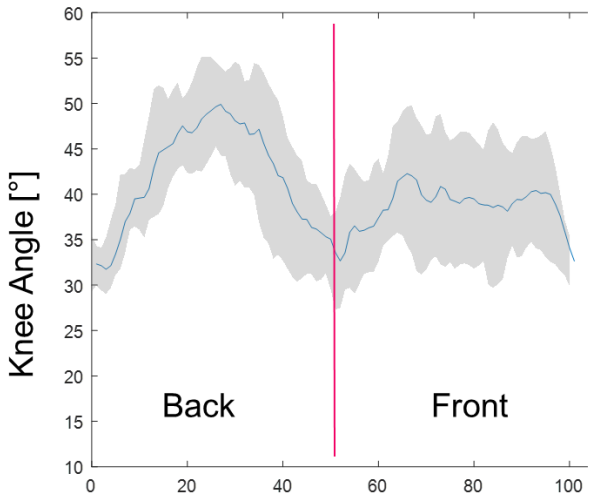
- Slalom de 30 virages (15 back, 15 front)
- 4 sujets (UL, LL1, LL2)
- 8 centrales Xsens (Lower Limb + Pelvis & Trunk)
- Cinématique du genou prothétique en virage back et front????

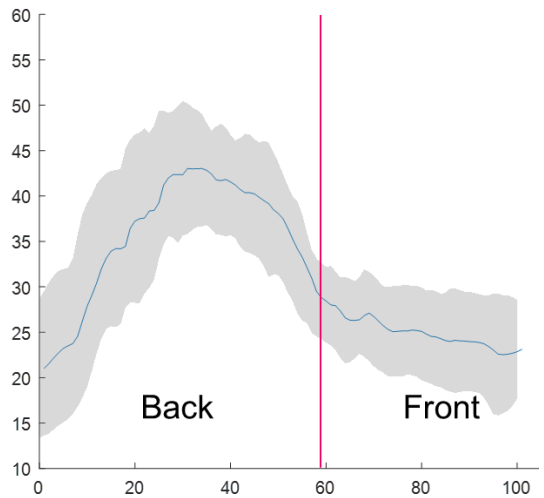




UL

LL1


Knee Angle [°]
60
55
50
45
40
35
30
25
20
15
10
0
20
40
60
80
100
Back
Front
% cycle


60
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15
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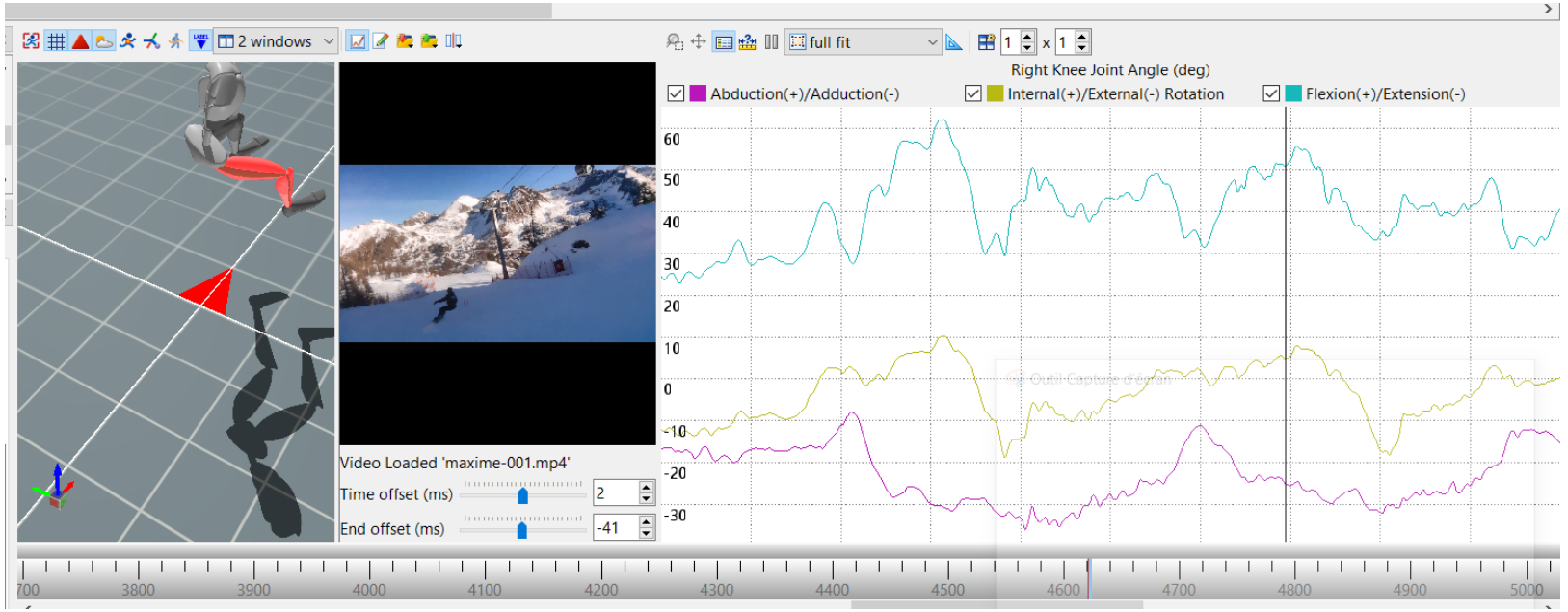
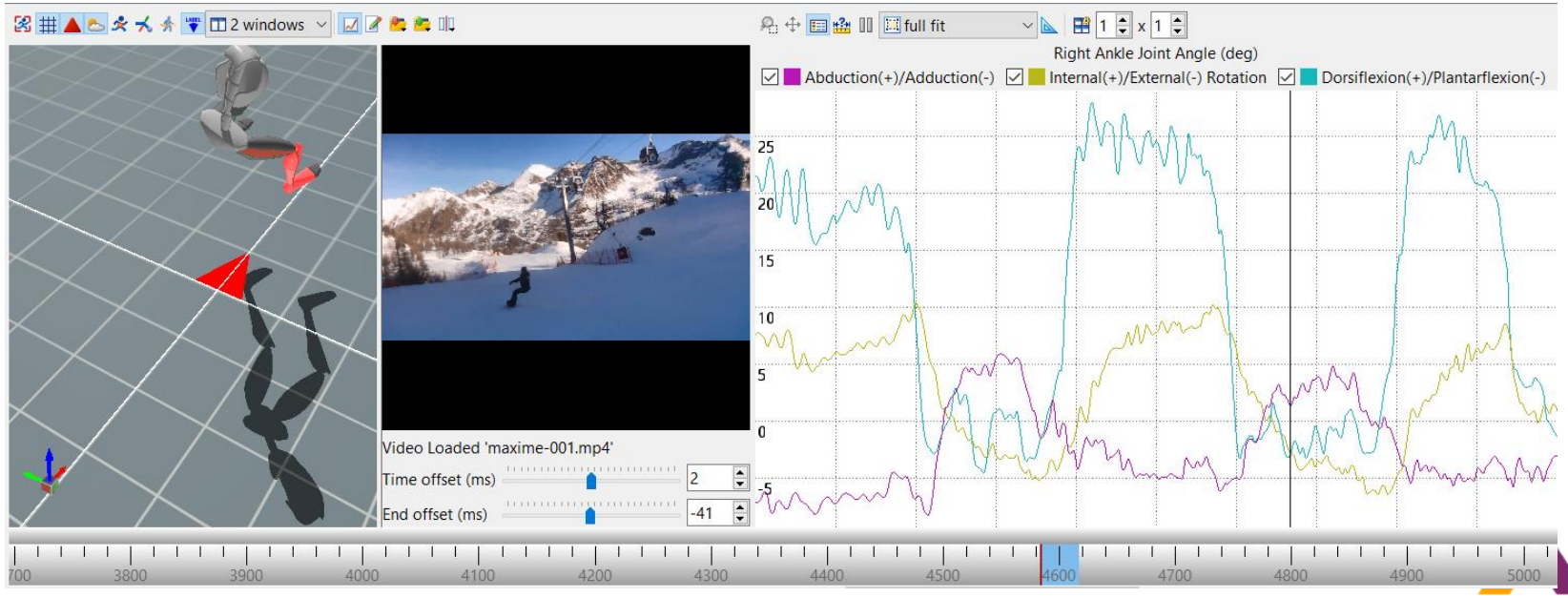
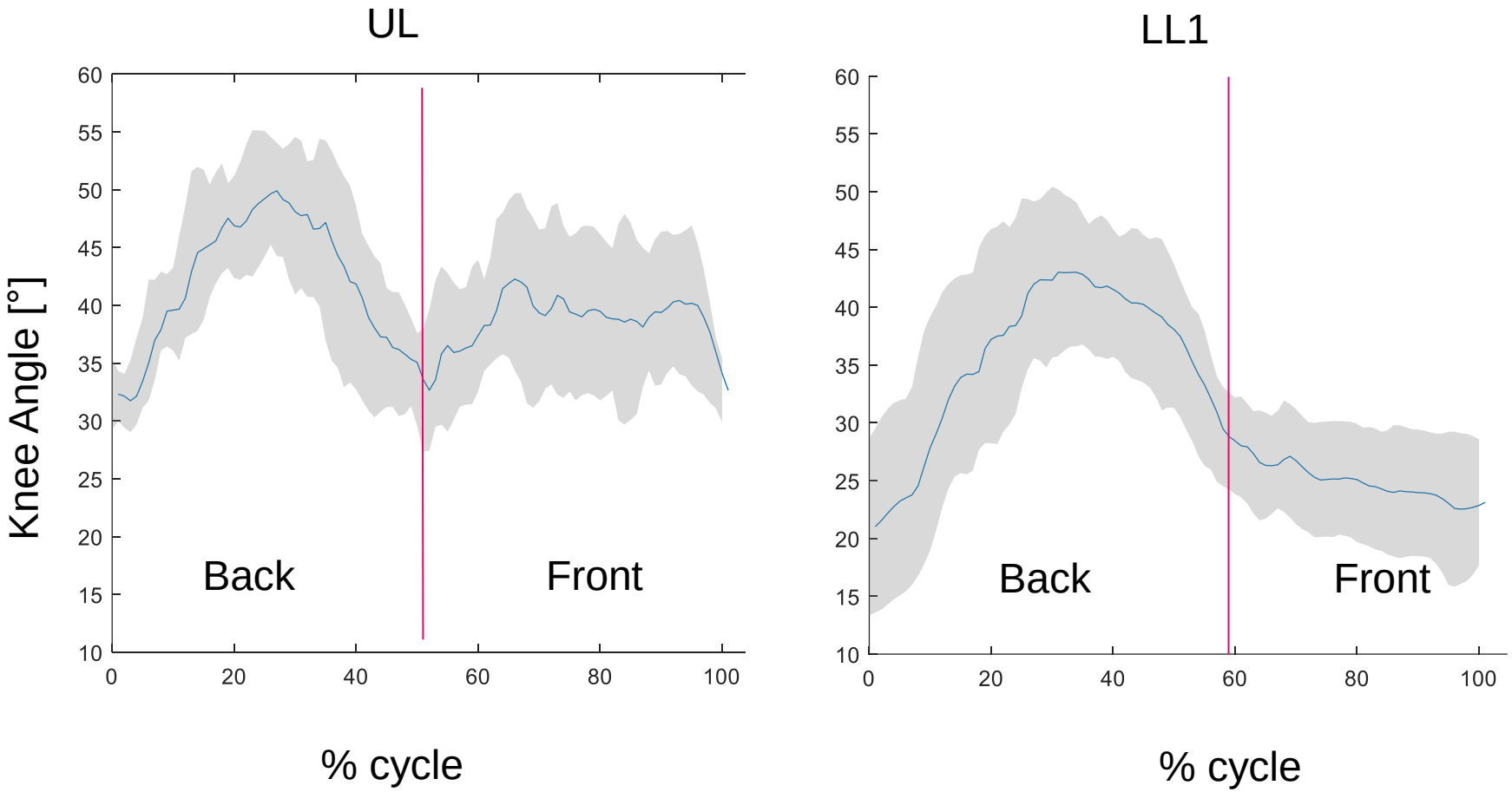
60
80
100
Back
Front
% cycle

Résultats : Flexion Genou et Cheville





Flexion genou sur l'ensemble du slalom



GRForce et axe de flexion du genou prothétique

Discussion

Limites :

- Nombre de sujets / tests limités
- Mesure des efforts nécessaire pour équilibre avant arrière
- Calibration nécessaire en haut de chaque descente

Cinématique

- Dorsiflexion de cheville « normale en virage front »
- Insuffisante pour permettre la flexion de genou
- Genou en arrière de la ligne carre vers centre de masse =>pas de flexion en virage front

- Virage back, flexion de genou trop importante?
- Résistance trop faible dans les premier degrés pour permettre une prise de carre efficace?

Next

- Caractériser le comportement des composants prothétiques seul
- Reproduire en laboratoire la situation?
- Réglages, alignement, évolution des composants?