



**HAL**  
open science

# Role of gait initiation in the analysis of human behaviour

Laure Coudrat

► **To cite this version:**

Laure Coudrat. Role of gait initiation in the analysis of human behaviour. Tohoku - Lorraine Conference, Health, Technology, and Humanities in the XXIeme Century, Sep 2019, Nancy & Metz, France. hal-02304240

**HAL Id: hal-02304240**

**<https://hal.univ-lorraine.fr/hal-02304240>**

Submitted on 3 Oct 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Seminar: Health, Technology, and Humanities in the XXI Century  
September 23<sup>th</sup> 2019

# Role of gait initiation in the analysis of human behaviour

**Laure Coudrat**

Lorraine University, 2LPN-CEmA Group (Cognition-EMotion-Action), EA 7489,  
Metz & Nancy, France

# What is gait initiation? A daily life movement



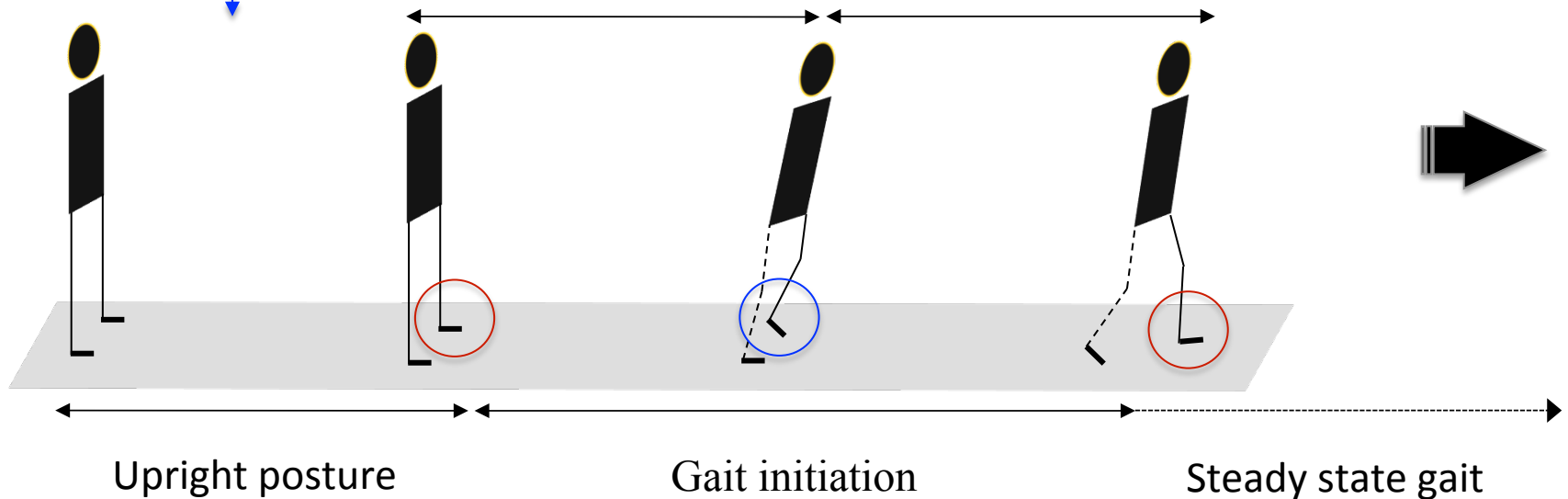
# What is gait initiation? Between biomechanics and neurosciences

- A **motor program** progressively built before movement onset according to the motor plan
- **Stored information**

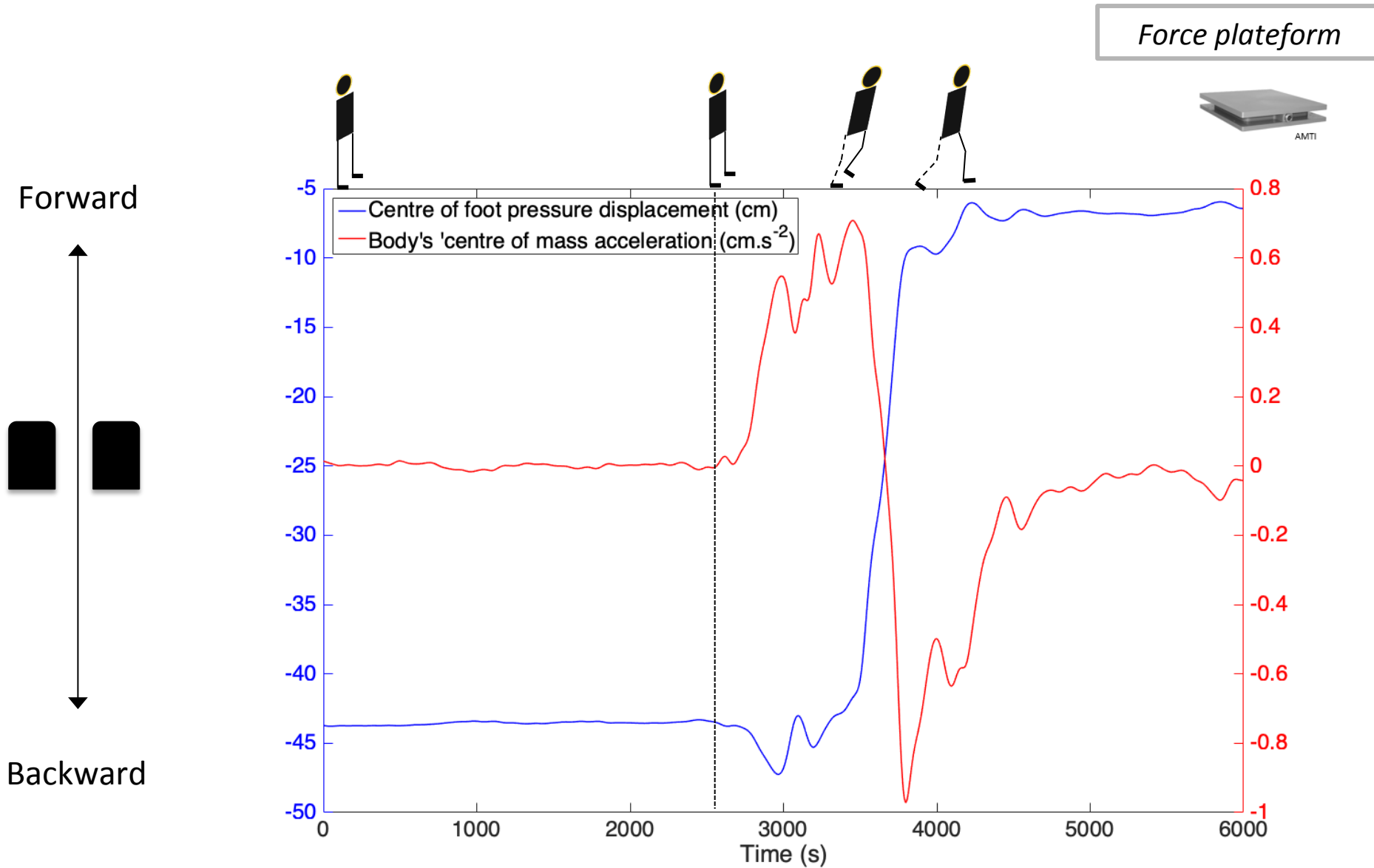
**Dynamics:** disequilibrium for reaching a given gait velocity  
**Anticipatory postural adjustments**

Anticipatory phase

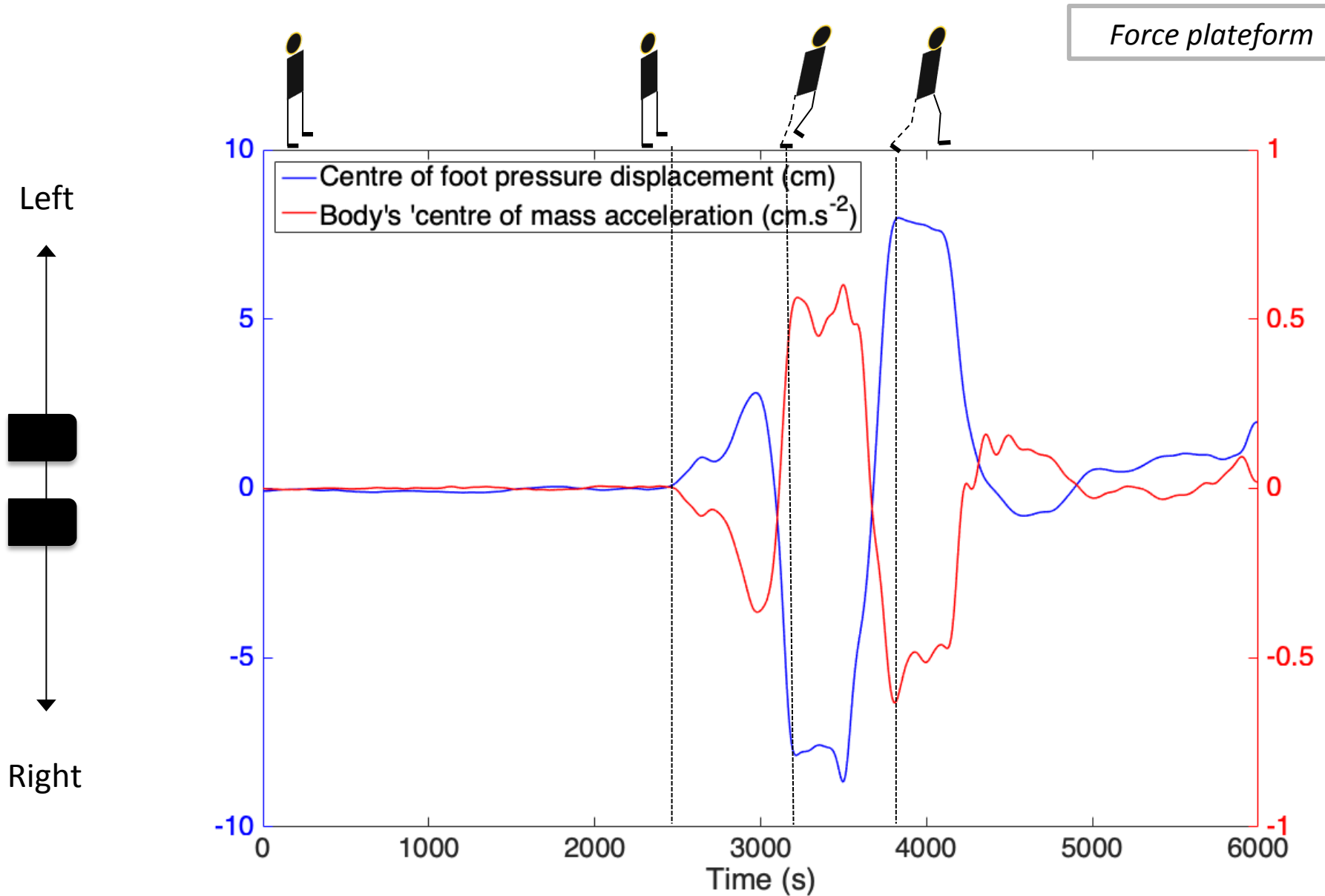
Execution phase



# How to evaluate gait initiation?

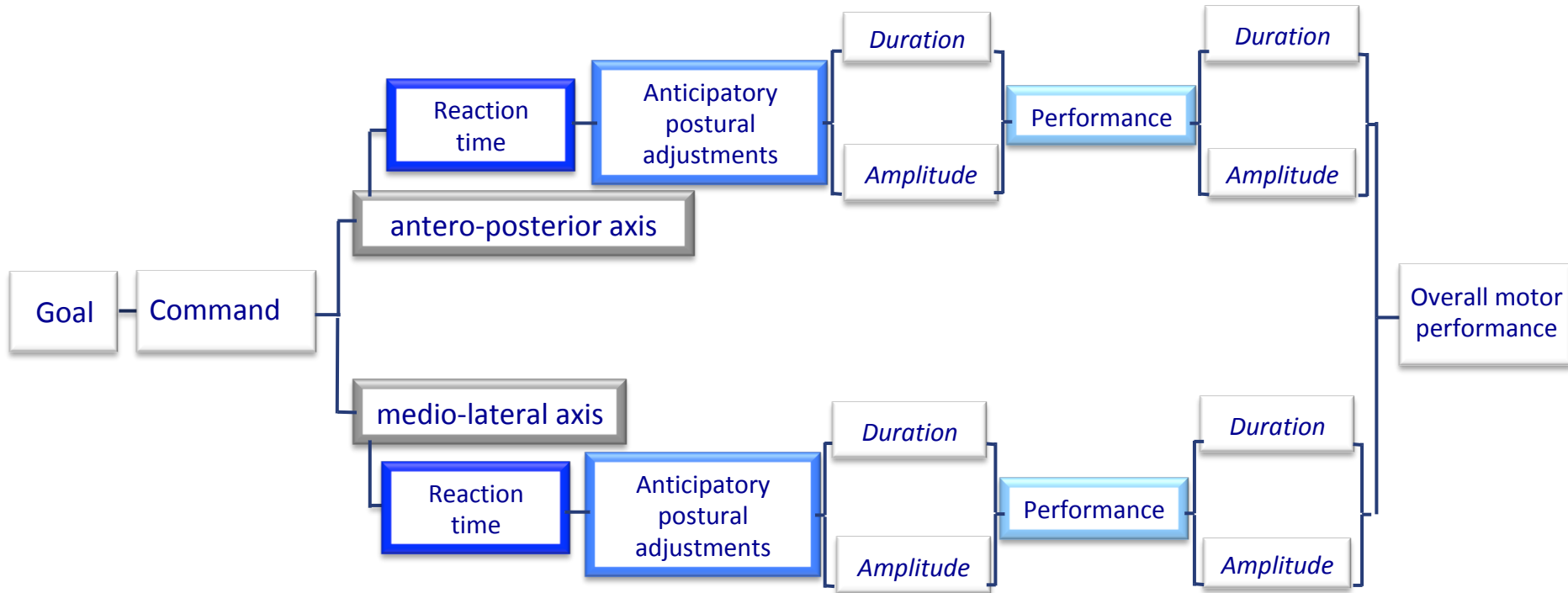


# How to evaluate gait initiation?



# How to evaluate gait initiation? An overview

## ➤ Forward progression

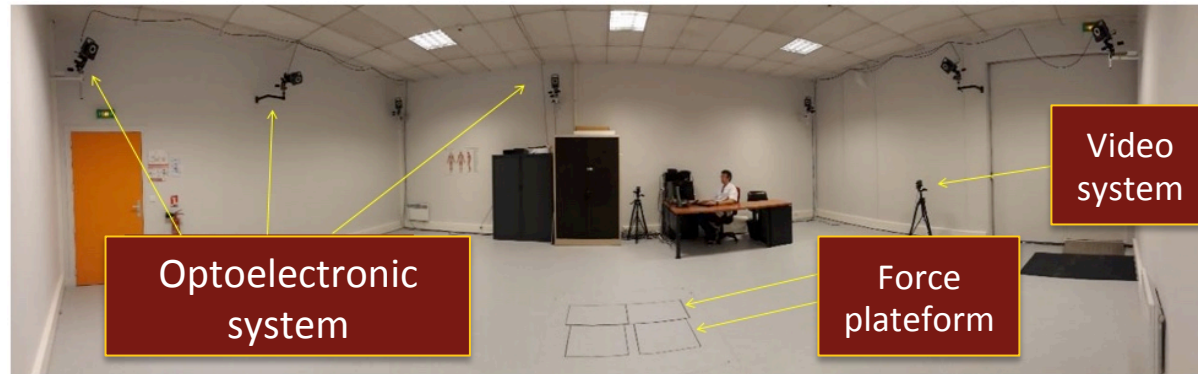
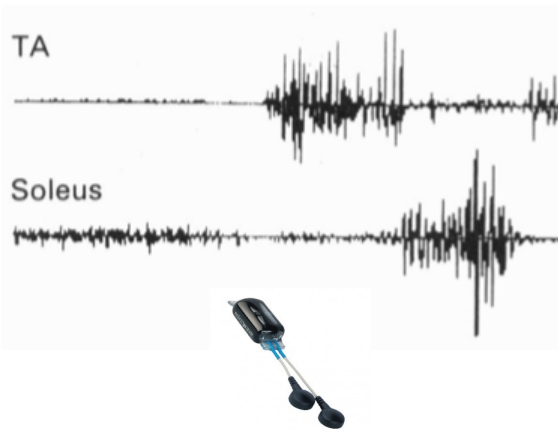


## ➤ Lateral stability

# How to evaluate gait initiation?

## The “gold standard” of gait initiation

### Electromyographic system



*Centre for the study of equipment for the disabled,  
CERAH, Woippy*

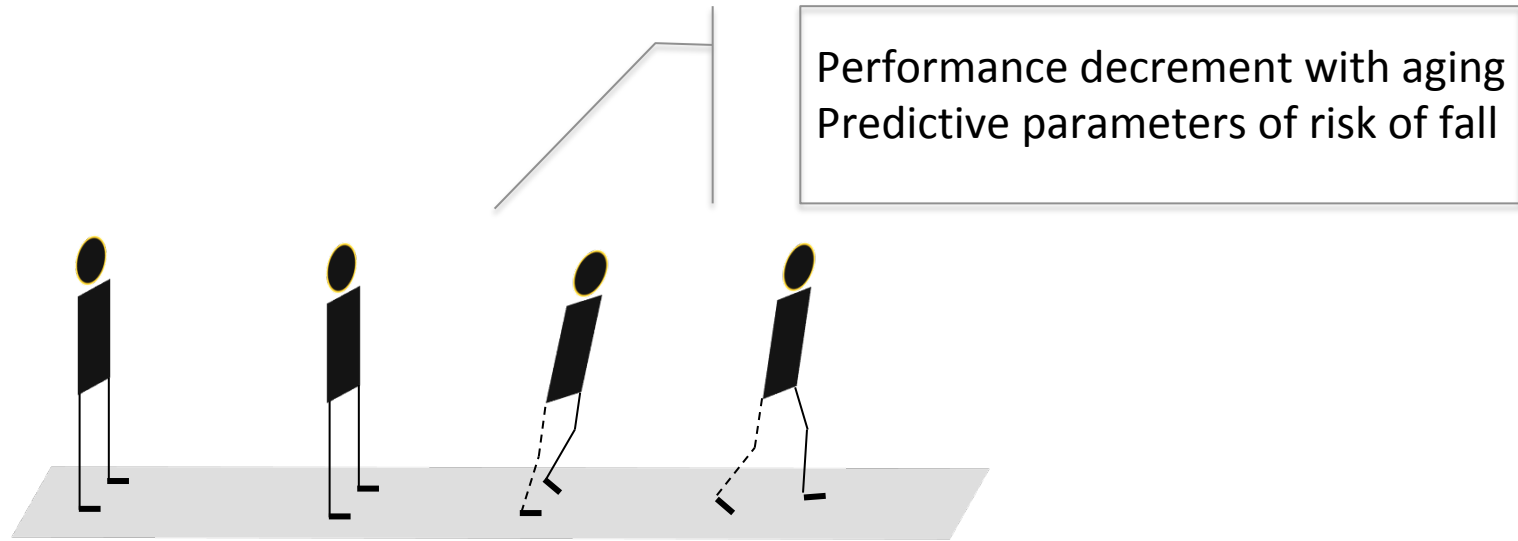


## An ambulatory system to evaluate gait initiation?





# Why do we need to study gait initiation? The case of elderly



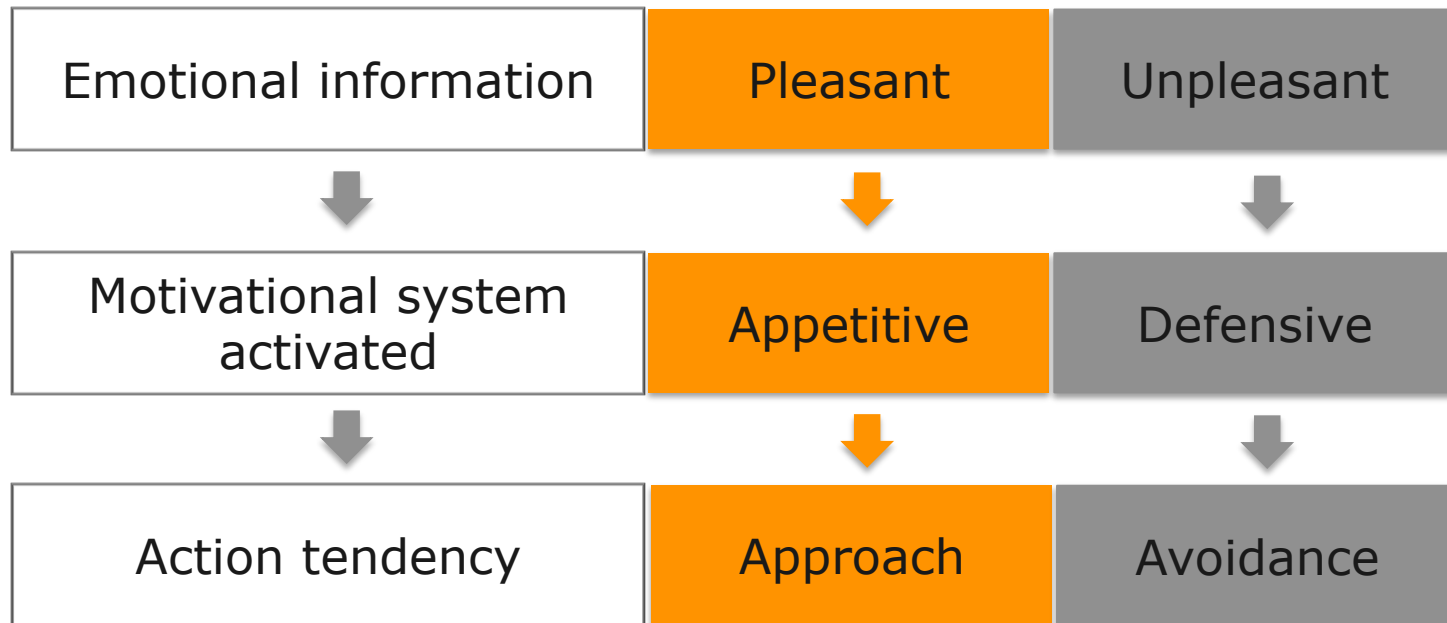
Motor function

Cognitive

Emotional

# A multi-componential approach of gait initiation including emotion

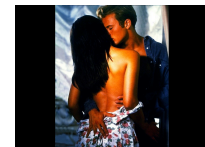
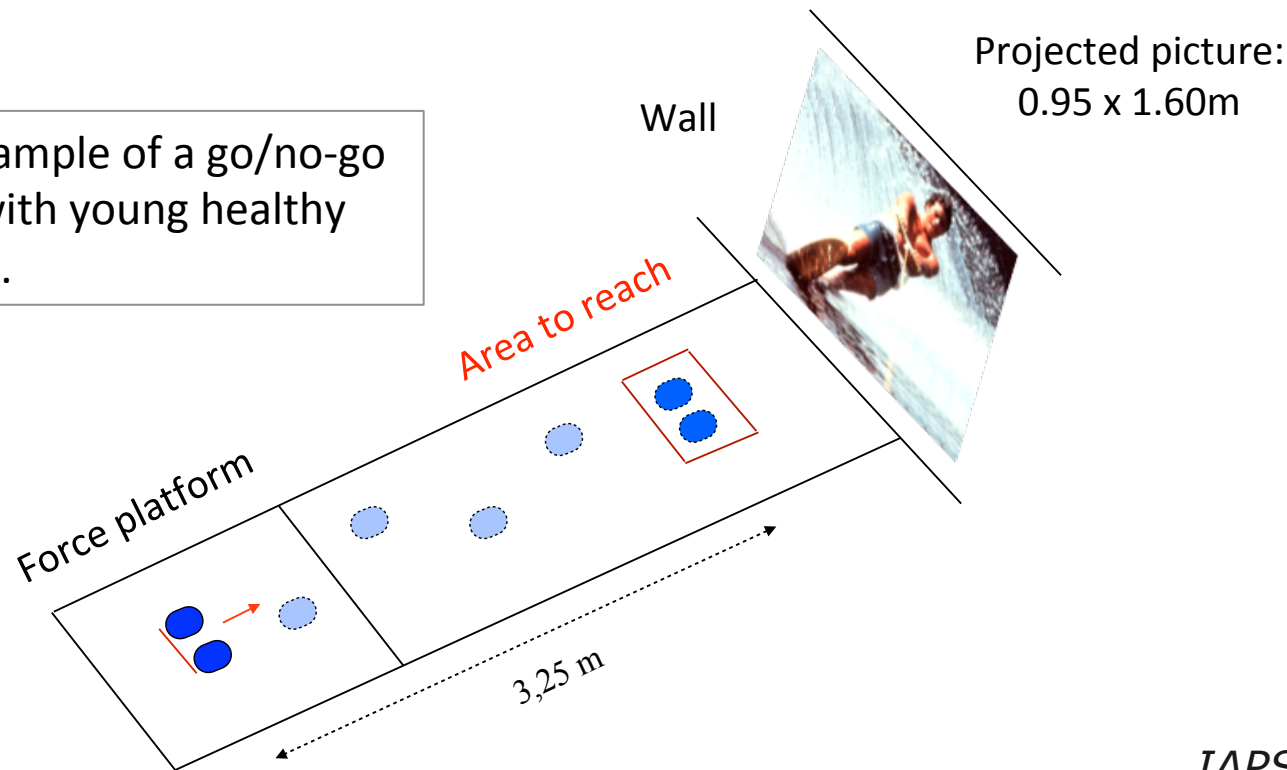
Biphasic theory of emotions (*Lang et al., 1997*)



# Conceptualizing gait initiation as an approach movement

Gait initiation: an approach movement allowing the decrease of the distance between the self and an affective stimulus location (*Markman & Brendl, 2005 ; Eder & Rothermund, 2008*)

An example of a go/no-go task with young healthy adults.



*IAPS (Lang et al., 2005)*

# Hypothesis

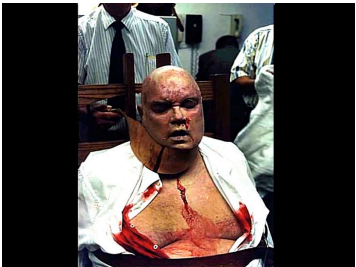


## **Congruent condition :**

Approach movement (forward gait initiation) – approach action tendencies (pleasant picture)



Congruency effect

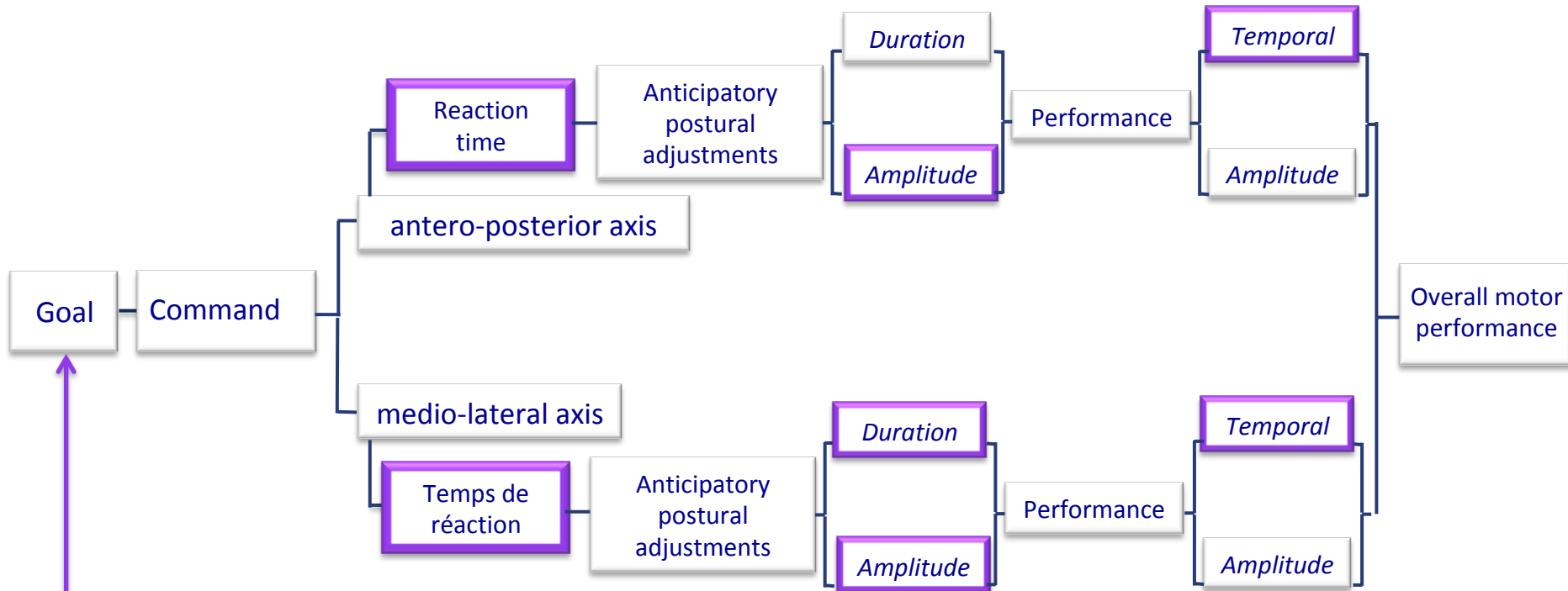


## **Incongruent condition :**

Approach movement (forward gait initiation) – avoidance action tendencies (unpleasant picture)

# Experimental variables and main results

## ➤ Forward progression



## ➤ Lateral stability



# Another study including both forward and backward steps

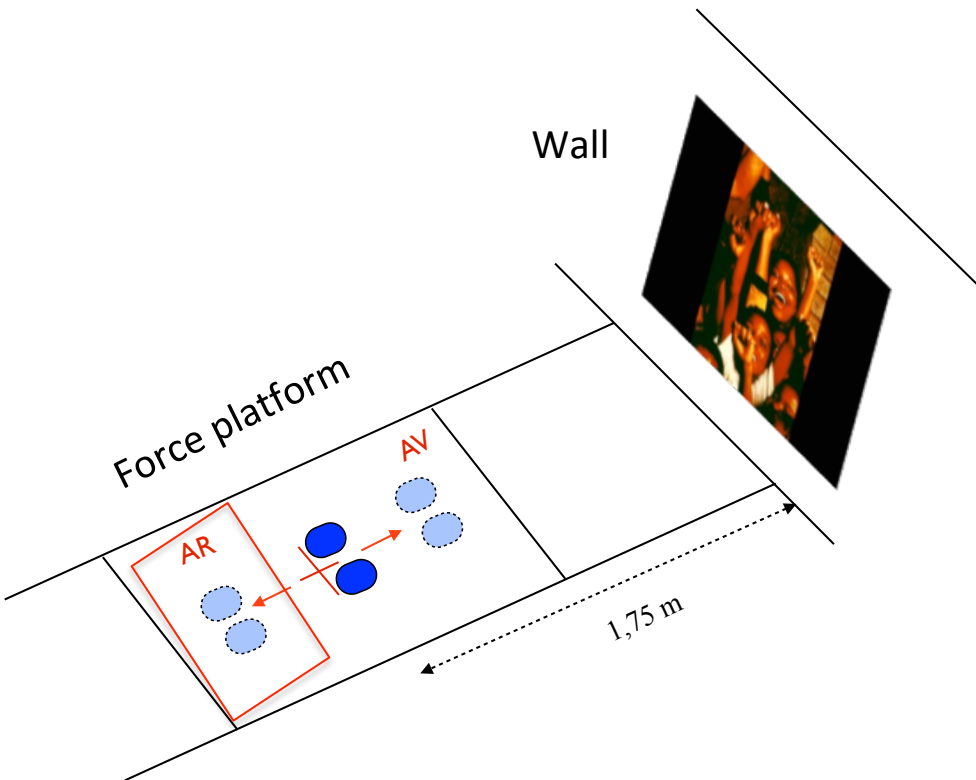
➤ **Congruent condition :**  
forward/backward step

➤ **Incongruent condition :**  
forward/backward step

**Results :** congruency effect only on the forward steps.

Why backward steps were not impacted by the emotional state?

- Is the approach/avoidance system not symmetrical?
- Is the backward step more cognitively demanding than forward step?



# Automatic and non automatic processing of emotional information. The case of specific emotion



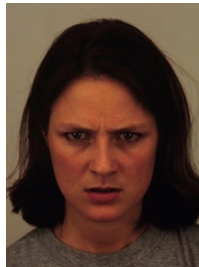
Fear



“automatic detection of threat”  
*e.g. Öhman et al., 2001*



Happiness



Angry



“no automatic detection”

## Hypothesis

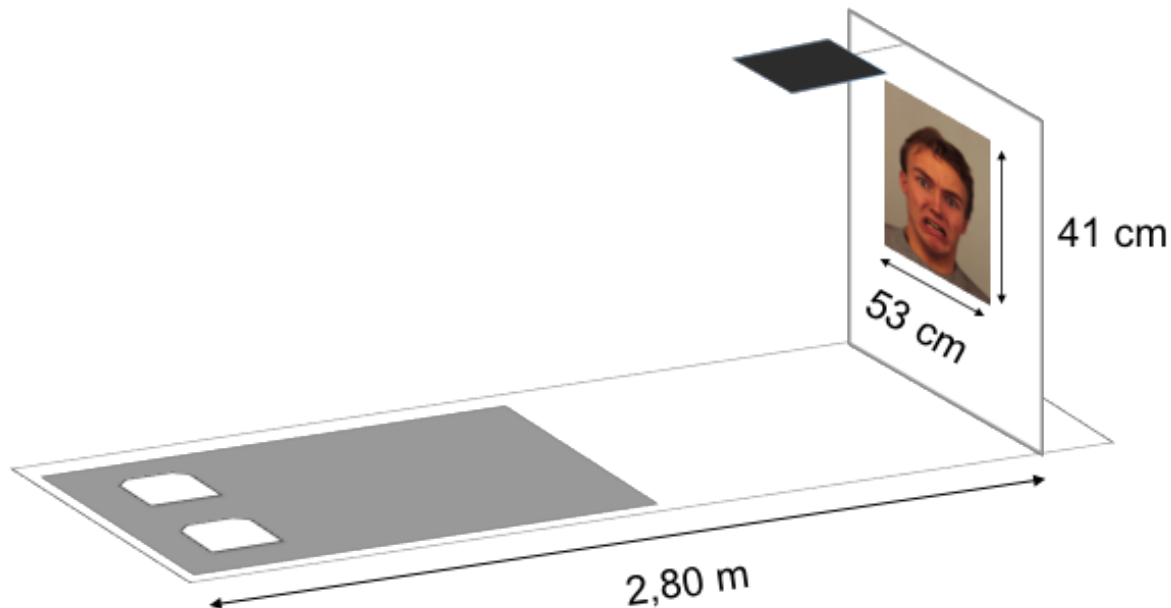
If gait initiation requires some attentional resources, then, its performance would be lower in front of happiness and angry faces than in front of fear pictures.

# An experimental study

Coudrat, L., Heurley, L.P., Caharel, S., & Kop, J.-L. (2018) –  
*Clinical Neurophysiology, SOFPEL Congress*

24 participants (students),  $21,5 \pm 4$  years old

- Go/no-go paradigm
- Two conditions: explicit and implicit
  - Explicit: Go (fear, angry, happiness) / no-go (neutral)
  - Implicit: Go (men or women) / no-go (women or men)
- Initiate a forward step with the dominant leg
- Reaction time task



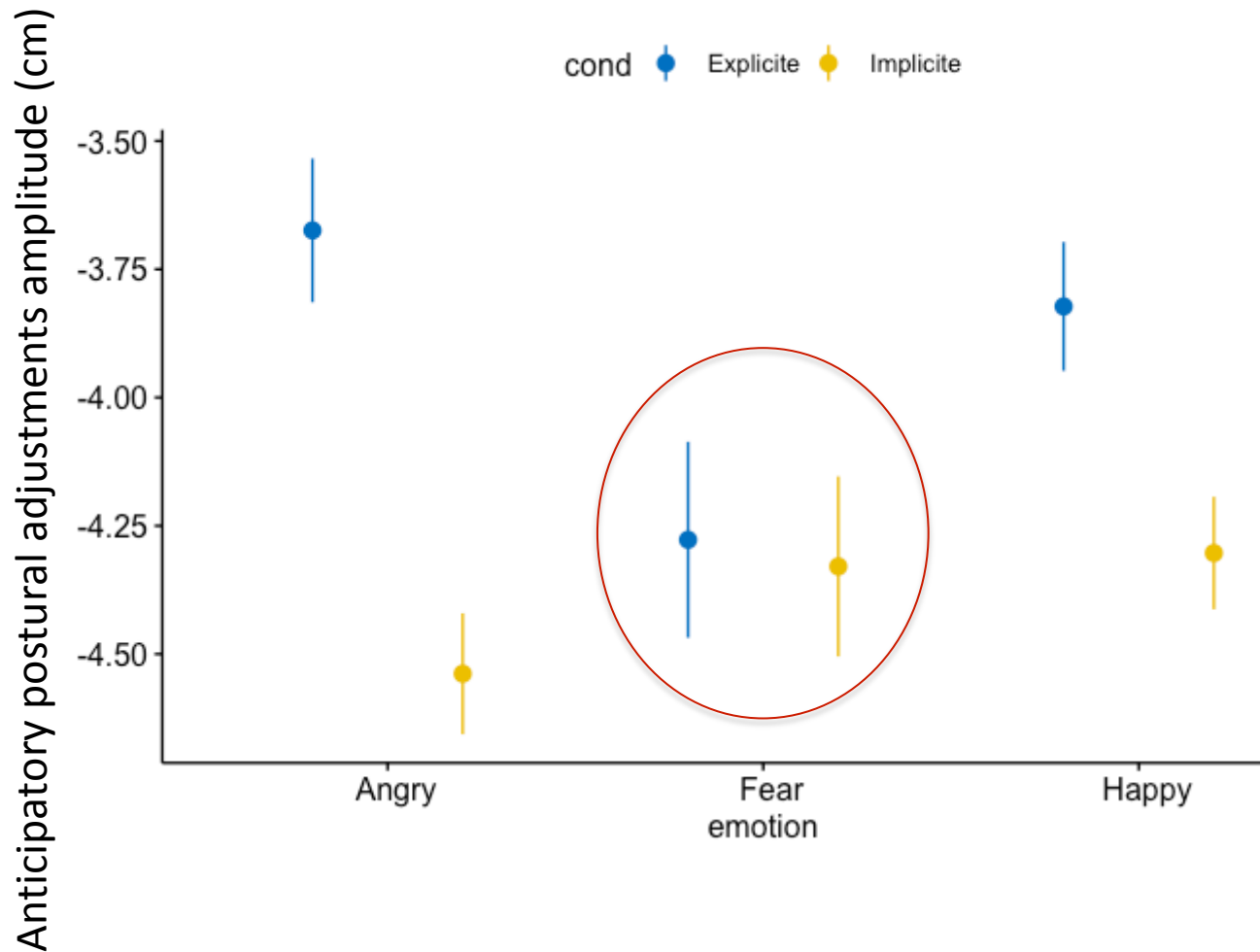
Face database: KDEF –  
*Lundqvist et al., 1998*



# An experimental study

Coudrat, L., Heurley, L.P., Caharel, S., & Kop, J.-L. (2018) –  
*Clinical Neurophysiology, SOFPEL Congress*

## Interaction between **condition** and **emotion**:



# Perspectives

- Gait initiation: a whole body movement including the motor, emotional and cognitive components
- Young adults versus vulnerable people
- A project we are developing: slowing down the degradation of the gait initiation of elderly by using a typical physical activity that is connected to the emotional, cognitive and/or motor component
- A second project we are developing: to validate an ambulatory system to evaluate gait initiation at home or not in a laboratory

## **2LPN**

Jérôme Dinet  
Jean-Luc Kop

---

## **2LPN & CHRU, Nancy**

Christel Jacob  
Thérèse Jonveaux

---

## **IRBA**

Marion Trousselard

---

## **CERAH**

Joseph Bascou