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Seminar: Health, Technology, and Humanities in the XXI Century  
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# Role of gait initiation in the analysis of human behaviour

**Laure Coudrat**

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# What is gait initiation? A daily life movement



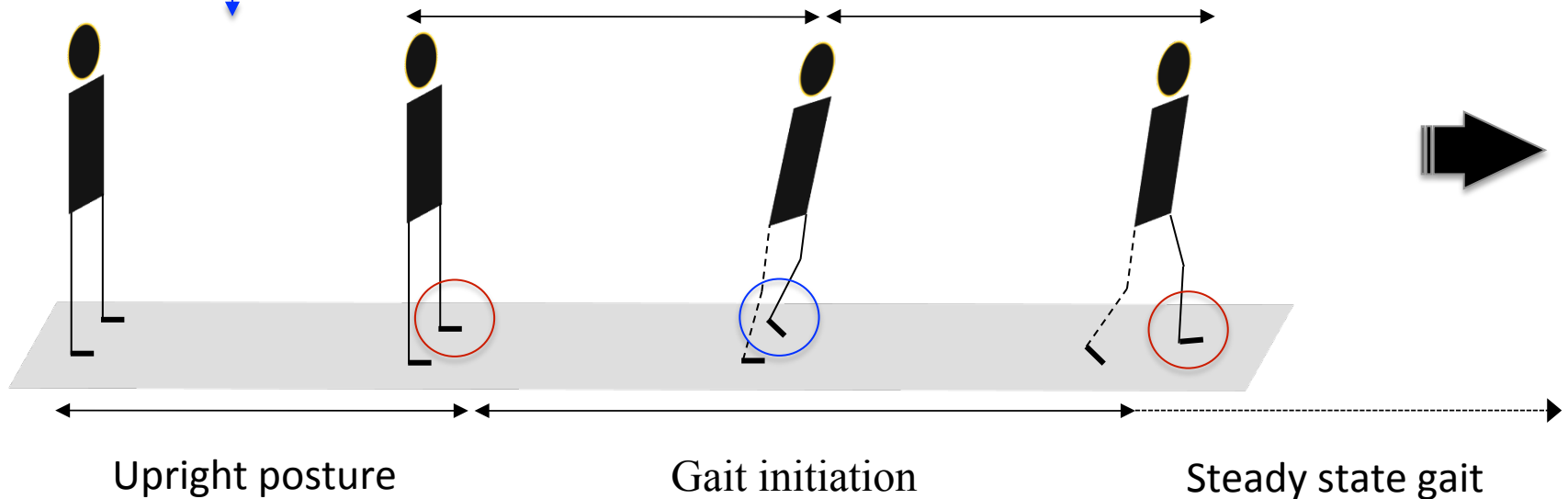
# What is gait initiation? Between biomechanics and neurosciences

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

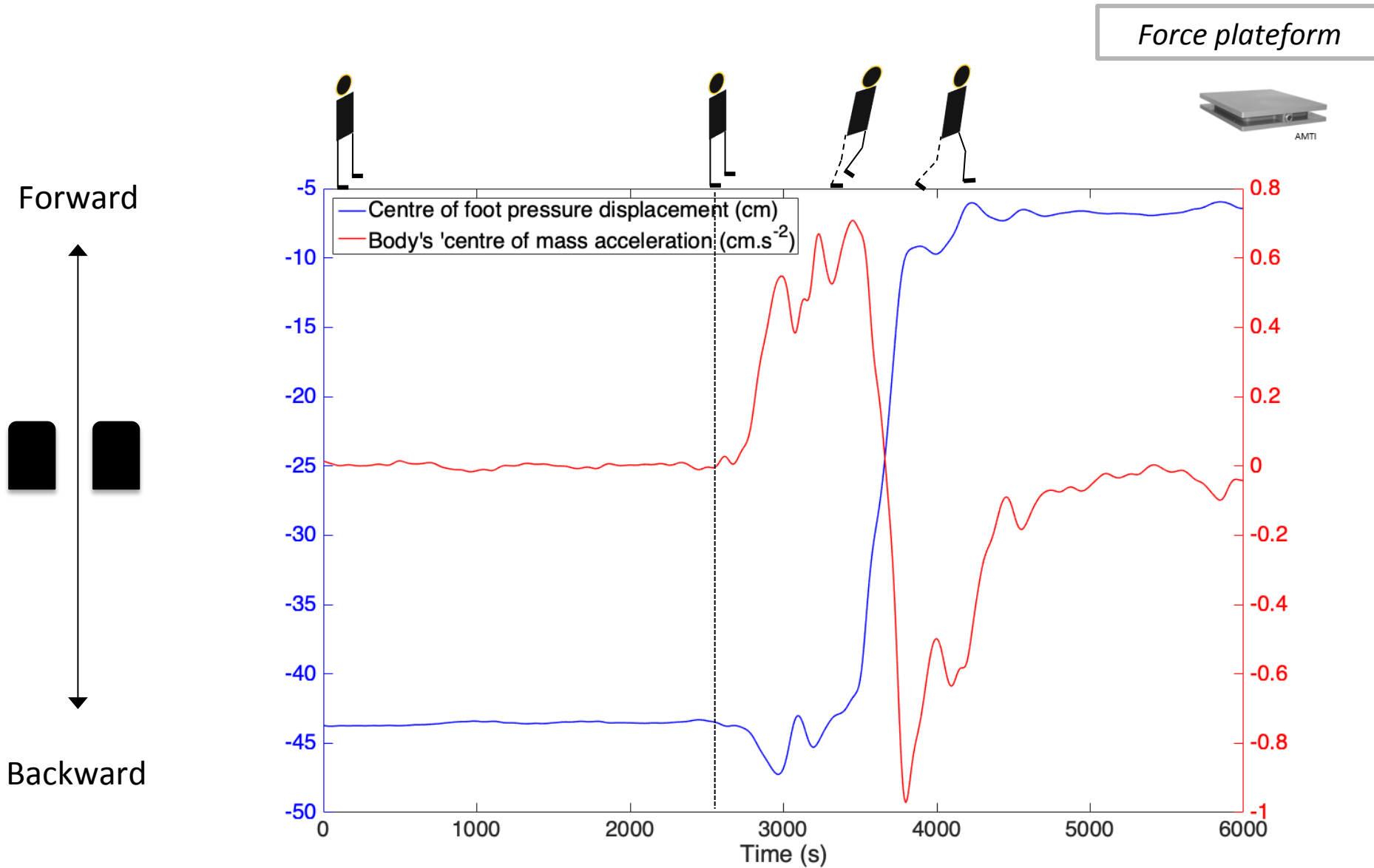
**Dynamics:** disequilibrium for reaching a given gait velocity  
**Anticipatory postural adjustments**

Anticipatory phase

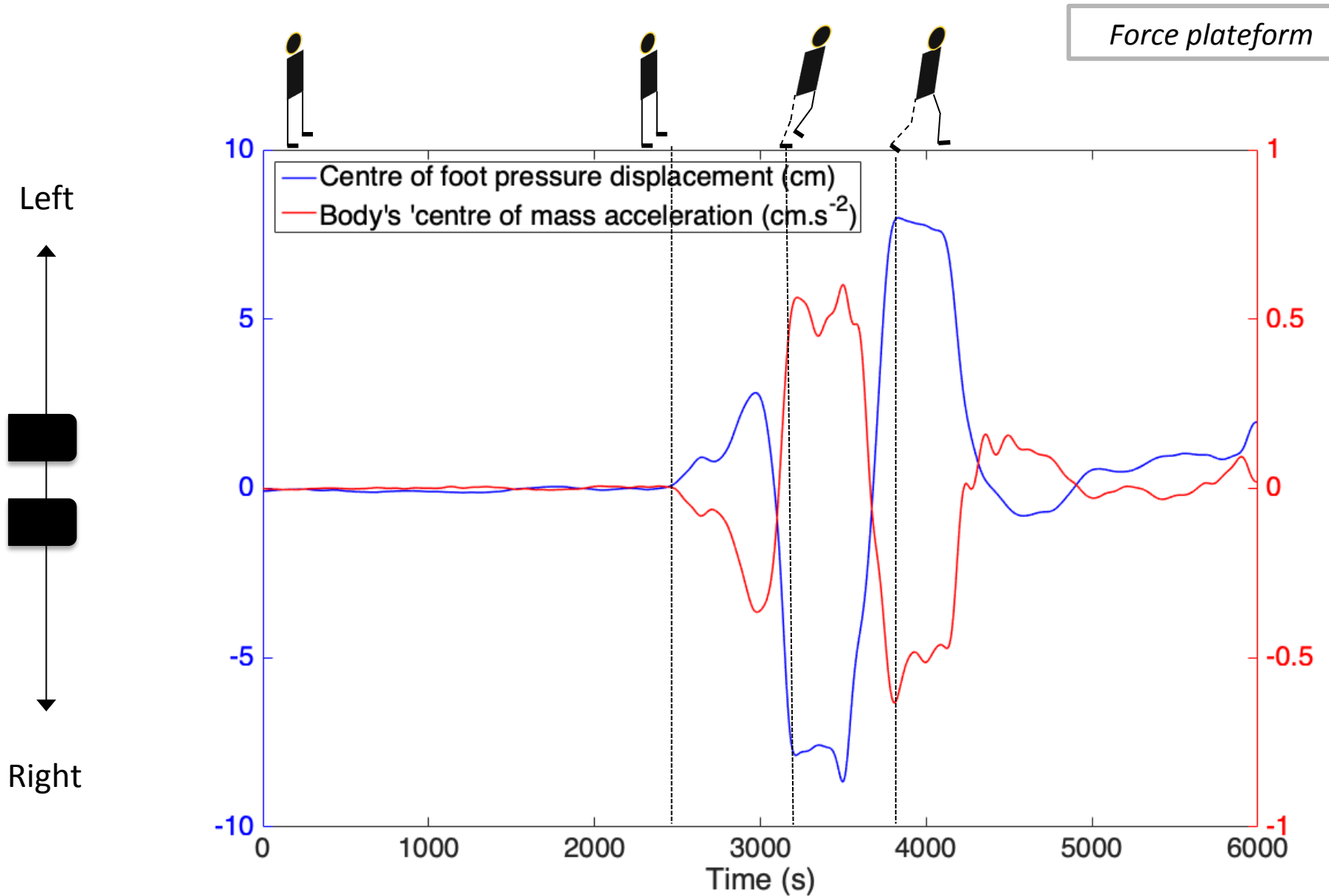
Execution phase



# How to evaluate gait initiation?

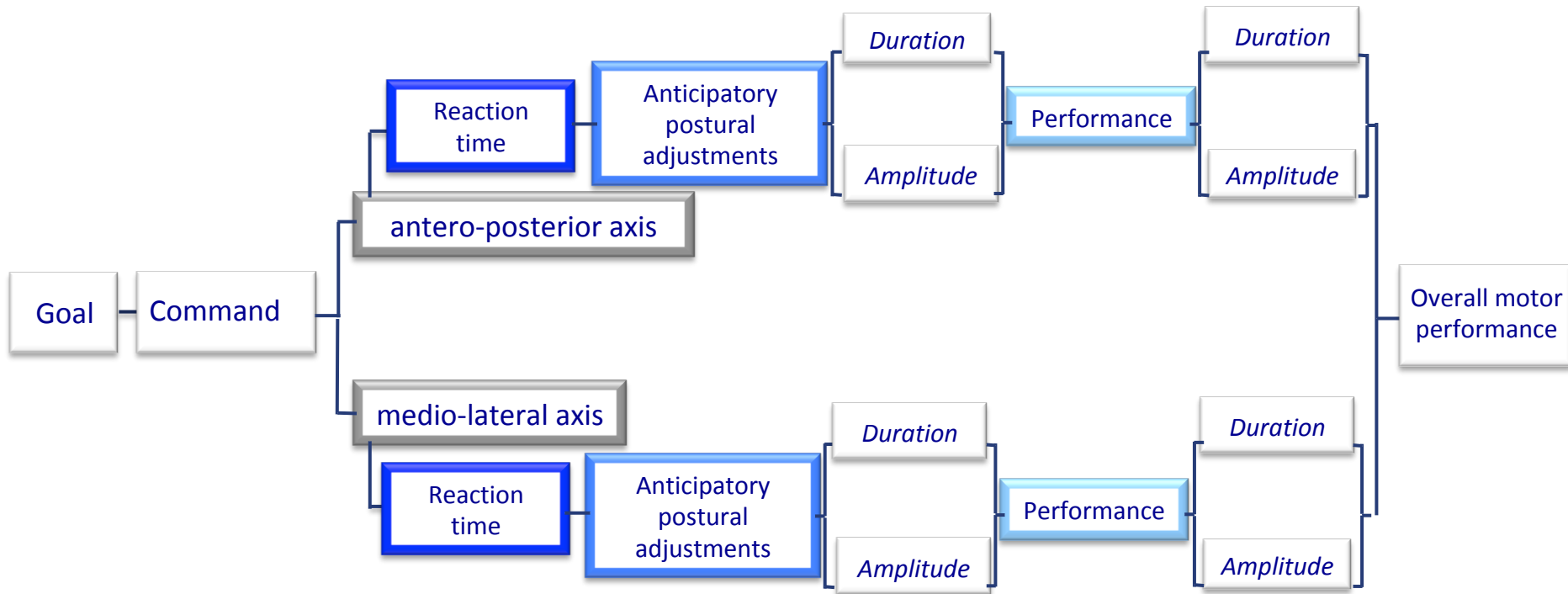


# How to evaluate gait initiation?



# How to evaluate gait initiation? An overview

## ➤ Forward progression

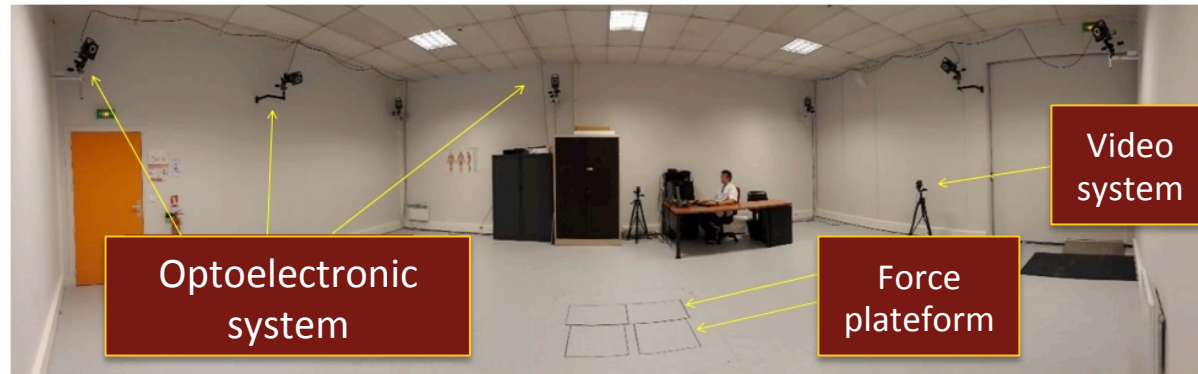
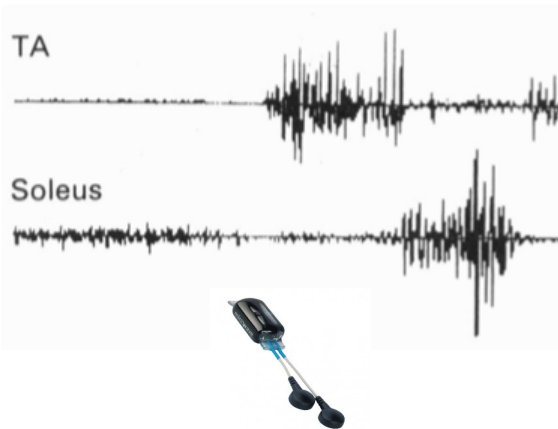


## ➤ Lateral stability

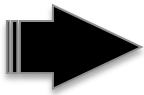
# How to evaluate gait initiation?

## The “gold standard” of gait initiation

### Electromyographic system



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

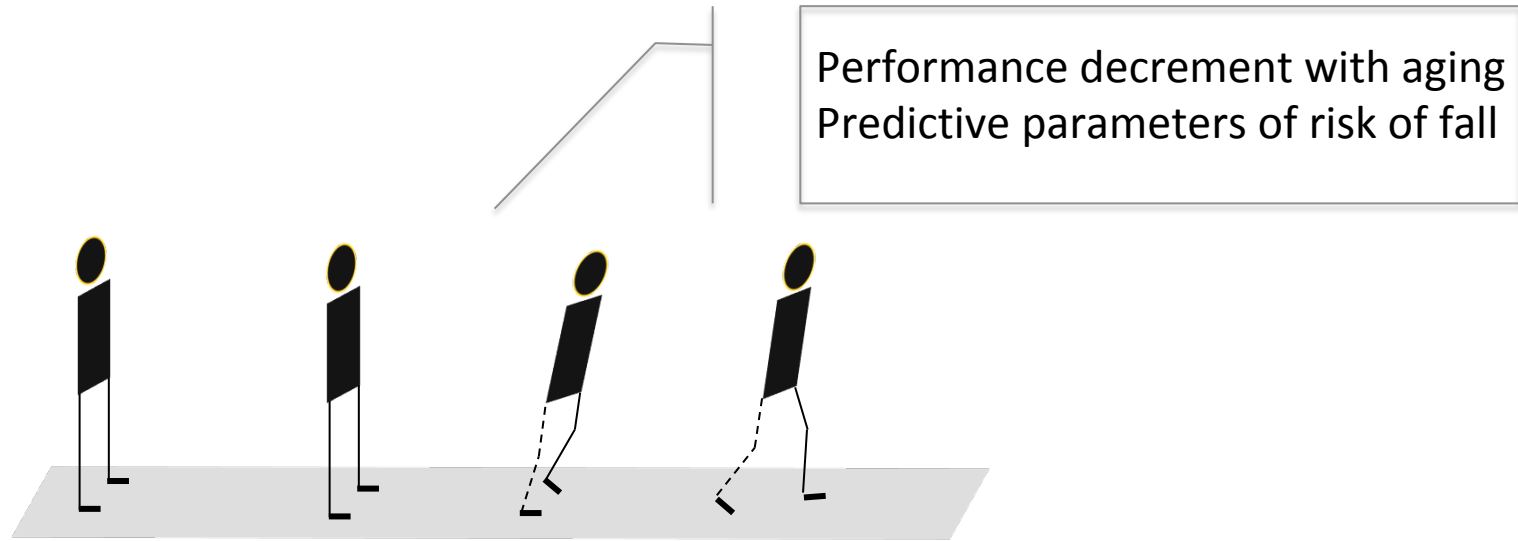


## An ambulatory system to evaluate gait initiation?





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



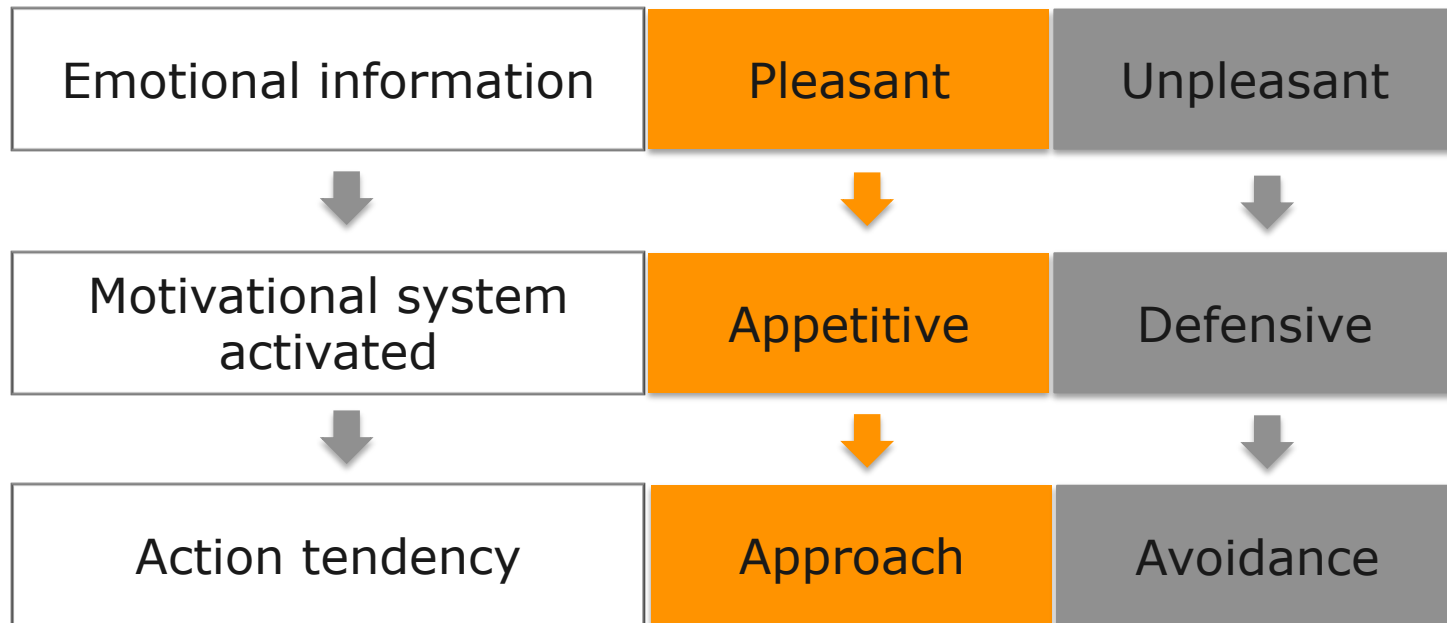
Motor function

Cognitive

Emotional

# A multi-componential approach of gait initiation including emotion

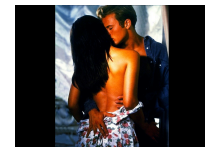
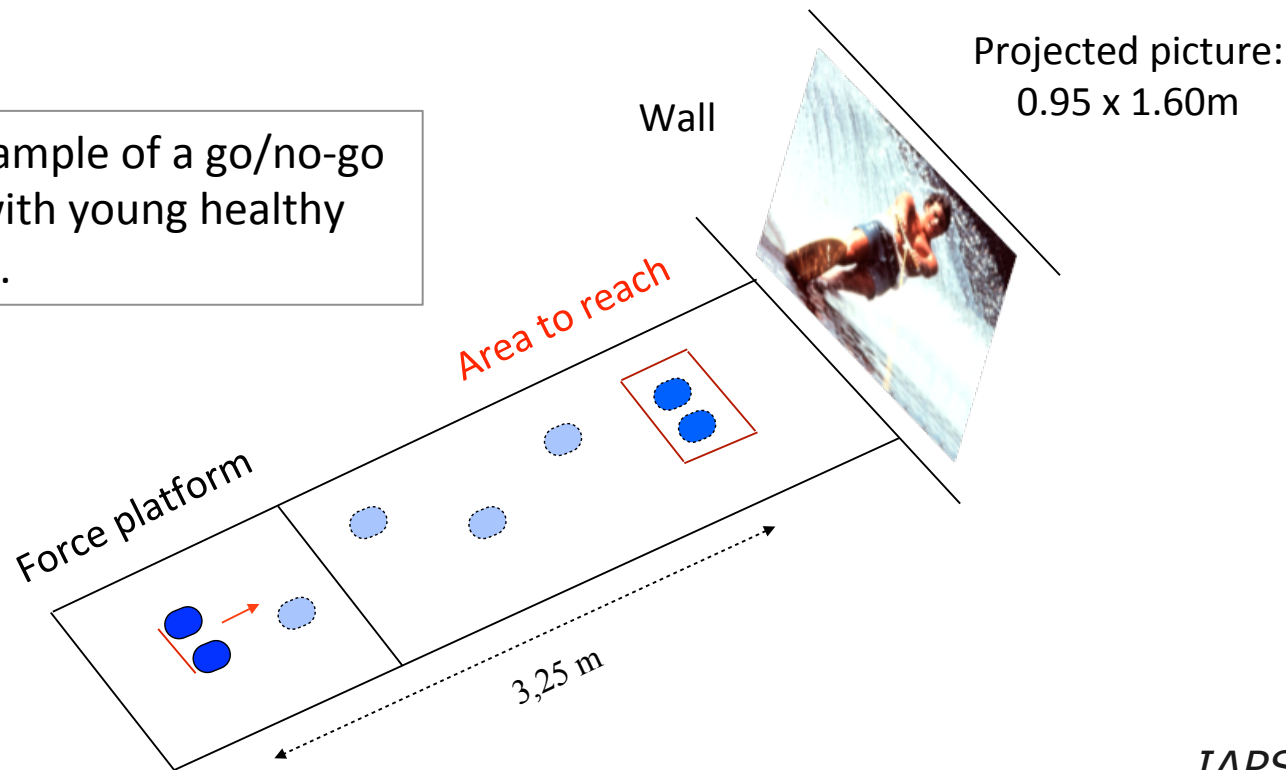
Biphasic theory of emotions (*Lang et al., 1997*)



# 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

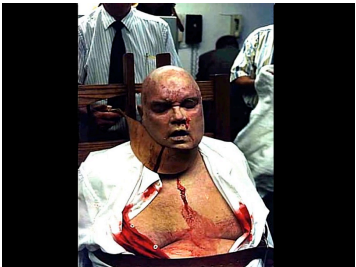


## **Congruent condition :**

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



Congruency effect

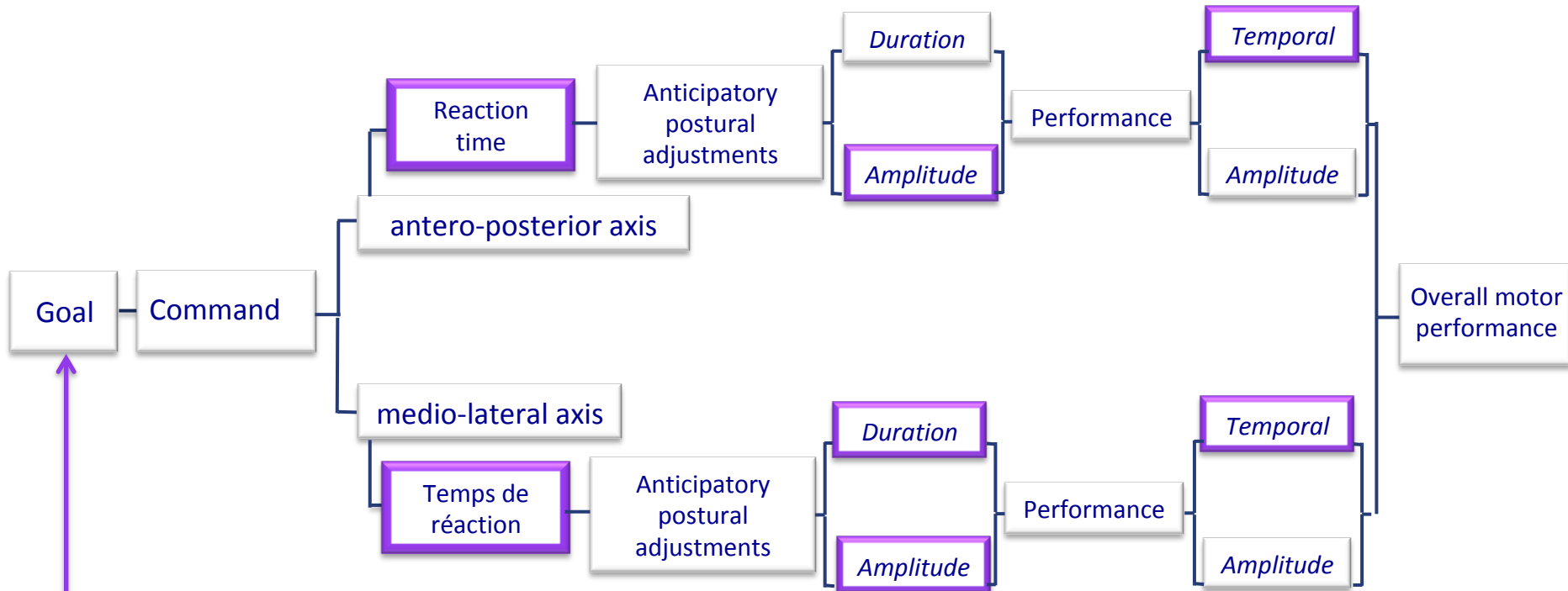


## **Incongruent condition :**

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

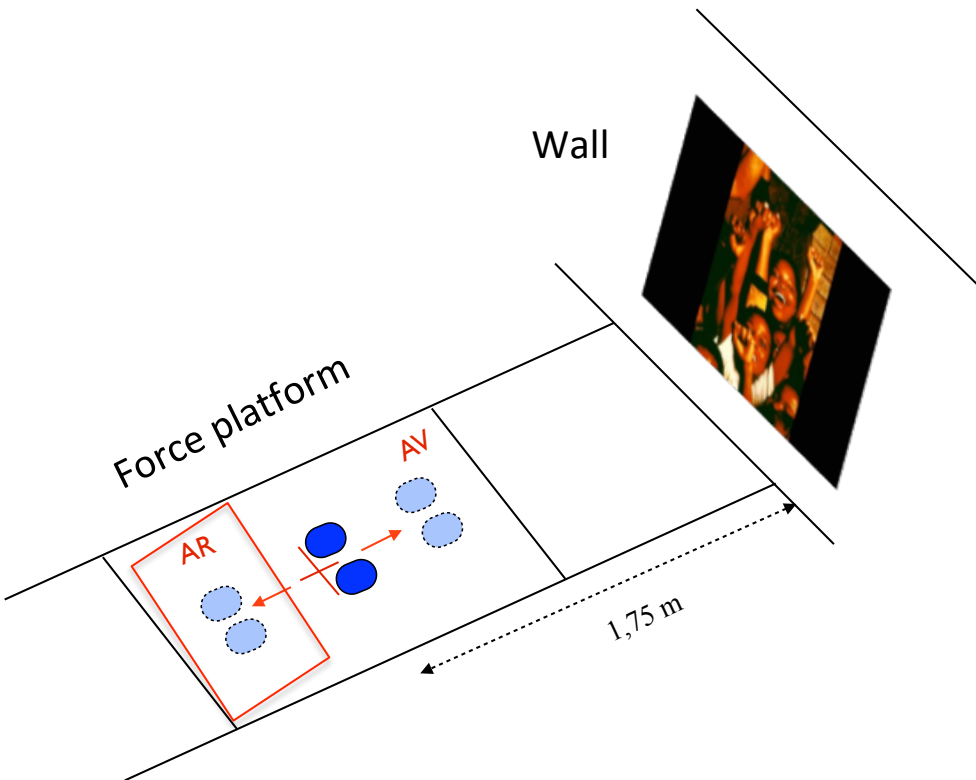
➤ **Congruent condition :**  
forward/backward step

➤ **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



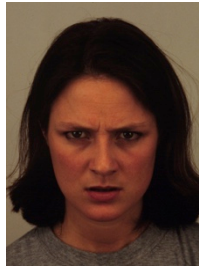
Fear



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



Happiness



Angry



“no automatic detection”

## Hypothesis

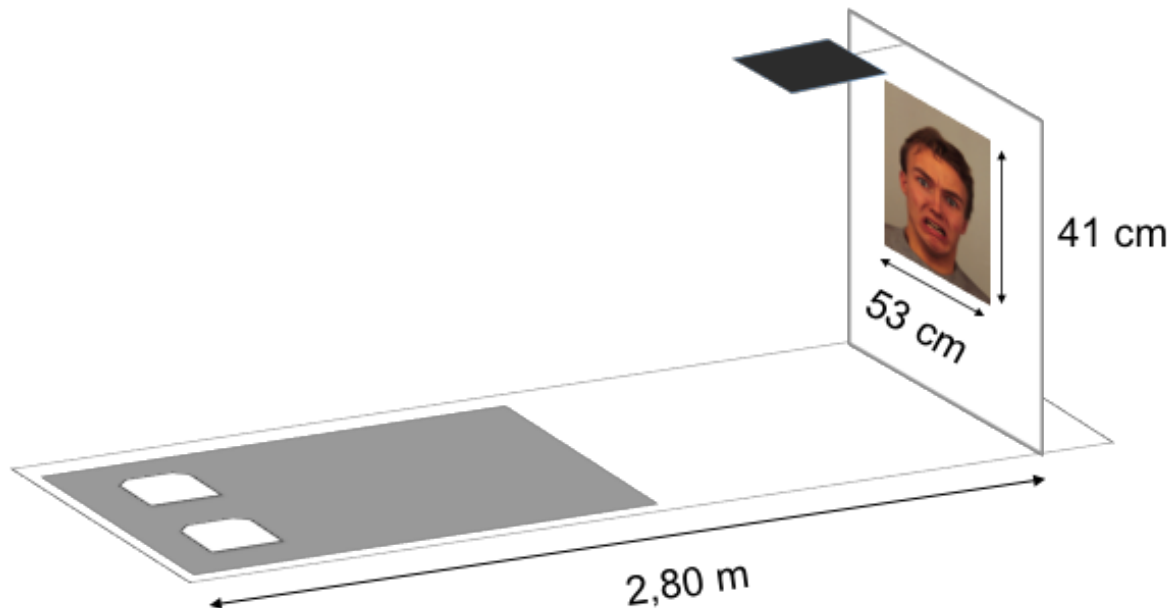
If gait initiation requires some attentional resources, then, its performance would be lower in front of happiness and angry faces than in front of fear pictures.

# 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



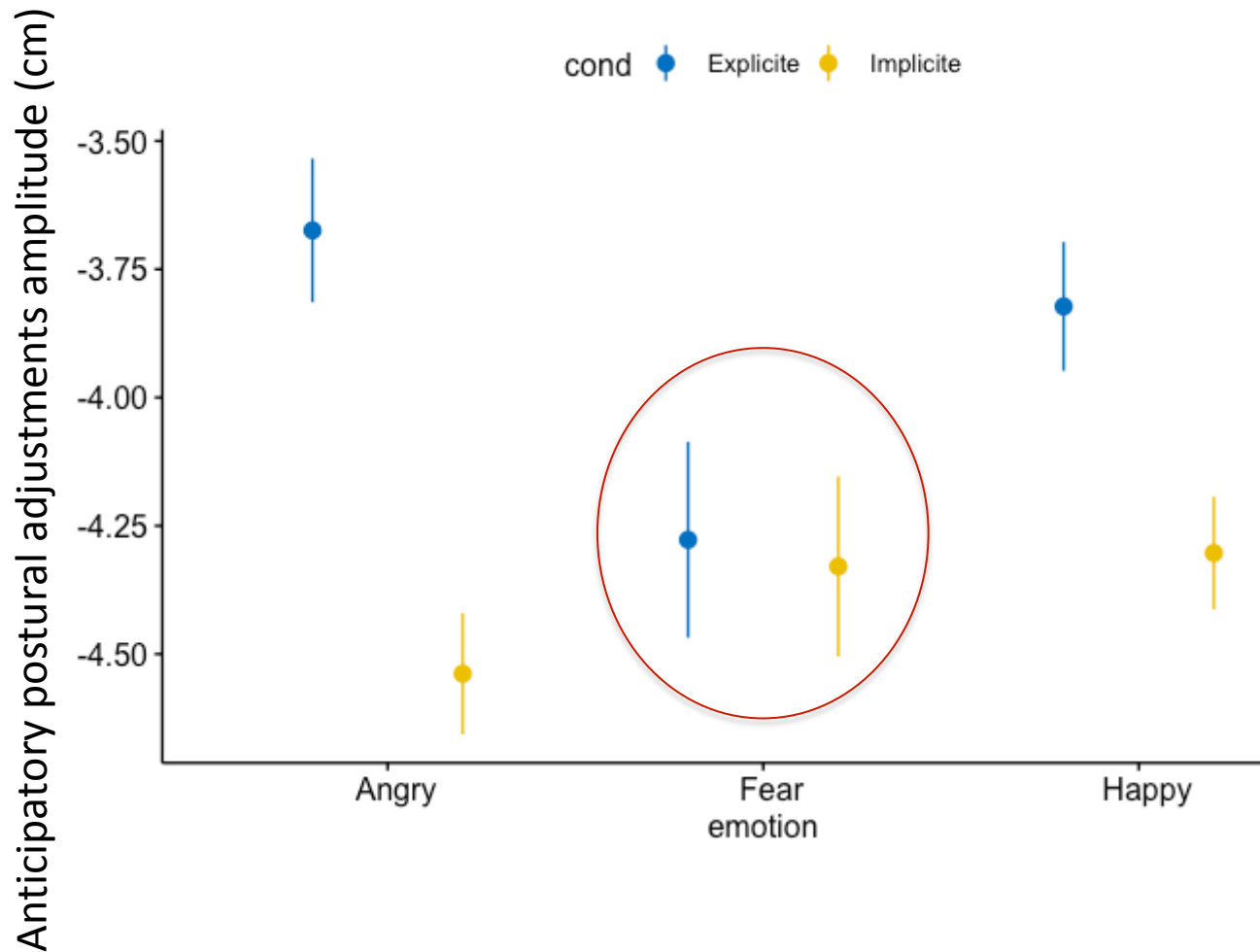
Face database: KDEF –  
*Lundqvist et al., 1998*



# 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

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