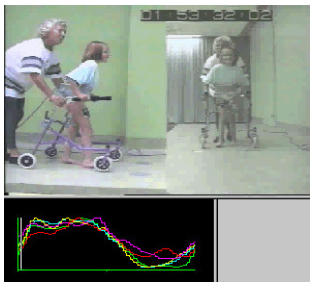
TRAMA: Bruxelles (15 janvier 2008)
"Motion analysis and clinics: why to set up a motion analysis lab".

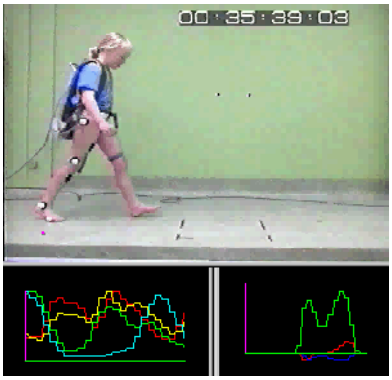
J. Duysens

A gait lab to study more than gait

Motor Control Laboratory
Research Center for Movement Control and Neuroplasticity
Dep. of Biomedical Kinesiology (FaBeR)
K.U. Leuven, Belgium
And : SMK-RDE,
Nijmegen , The Netherlands

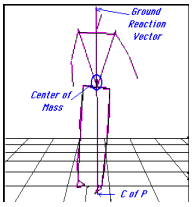
Example: clinical gait analysis Cerebral Palsy

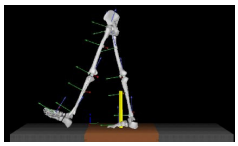


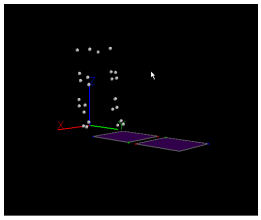


Nijmegen Motor Unit

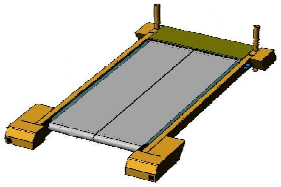
AMTI force plate







SPLIT-BELT



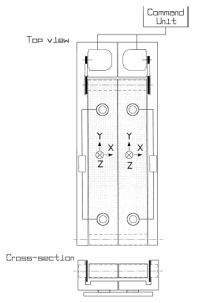
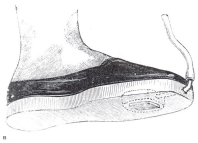


Fig. 1. Diagram of the treadmill ergometer.

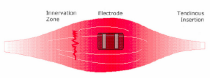


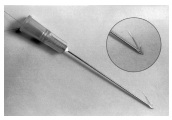
EMG

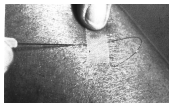
EMG stands for electromyography. It is the study of muscle electrical signals.

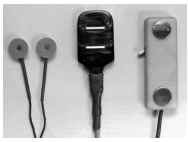
Electrodes are placed on the skin overlying the muscle. Alternatively, wire or needle electrodes are used and these can be placed directly in the muscle.

When EMG is acquired from electrodes mounted directly on the skin, the signal is a composite of all the muscle fiber action potentials occurring in the muscle(s) underlying the skin. These action potentials occur at somewhat random intervals so at any one moment, the EMG signal may be either positive or negative voltage. Individual muscle fiber action potentials are sometimes acquired using wire or needle electrodes placed directly in the muscle.



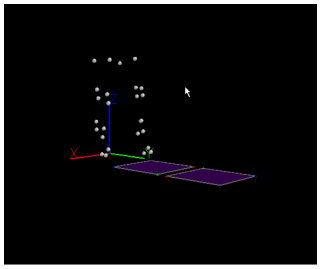




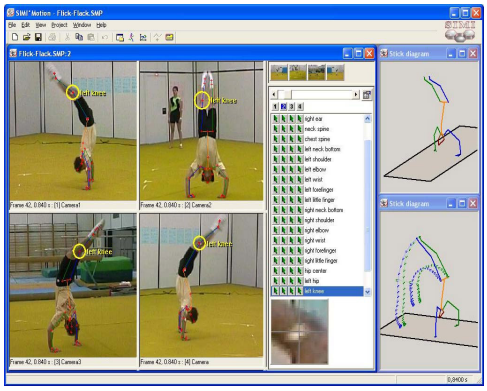


Telemetric EMG

VICON



Simi motion : digitale video



TRAMA: Bruxelles (15 janvier 2008)
"Motion analysis and clinics: why to set up a motion analysis lab".

J. Duysens

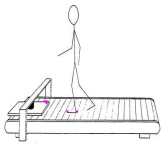
A gait lab to study more than gait

Motor Control Laboratory
Research Center for Movement Control and Neuroplasticity
Dep. of Biomedical Kinesiology (FaBeR)
K.U. Leuven, Belgium
And : SMK-RDE,
Nijmegen , The Netherlands

Project 1 Freezing in PD

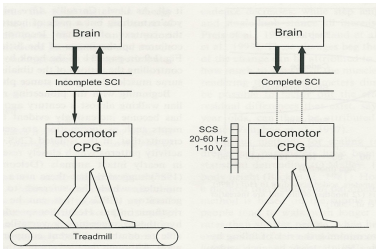
Research question

- How to INDUCE freezing of gait on a treadmill?
  - Obstacles



Project 2: EM-SCI

- International Multi-Center study

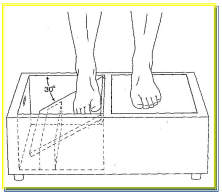


Project3: SPORTS injury nr 1

Ankle sprains

REFLEXES AS DEFENSE?

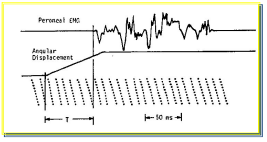
Peroneus Longus



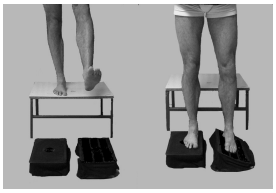
PREVIOUS STUDIES: STANDING

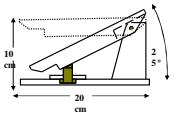
INVERSION 30 DEG.

JOHNSON ET JOHNSON,1993
ISAKOV ET AL., 1986



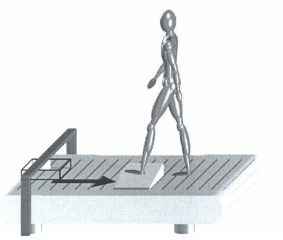
Closer to real life

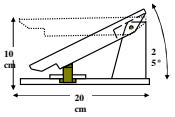




50% inverting, 50 % non-inverting

Grüneberg, Nieuwenhuijzen and Duysens, JPhysiol., 2003





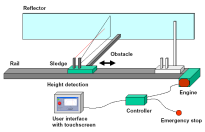
50% inverting, 50 % non-inverting

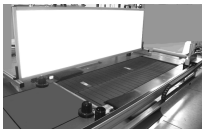
Nieuwenhuijzen and Duysens, 2007 (JN, in press)

Project 4

Project 4: Falls/ Eurokinesis

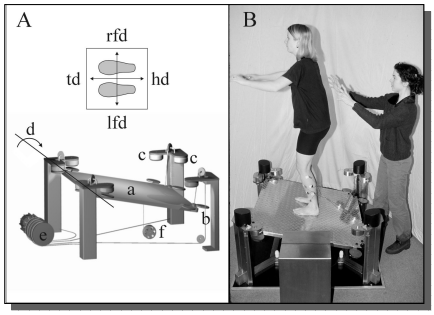
Project 4: Eurokinesis



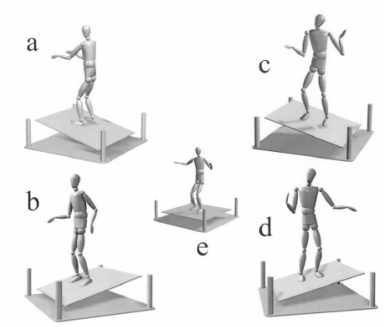


Learn how to fall

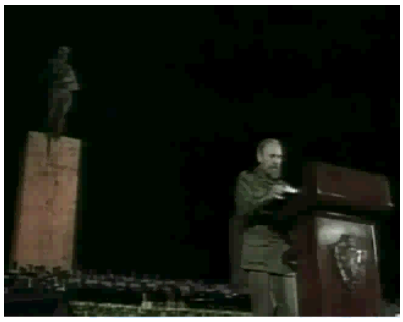
Project 5: Balance
(Lars Oude Nijhuis/Bas Bloem)

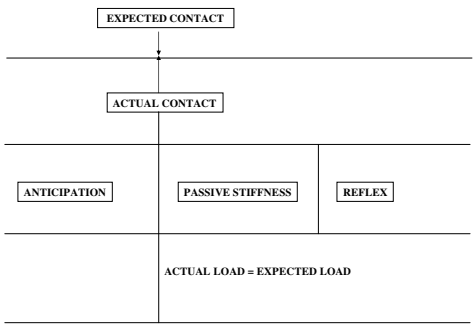


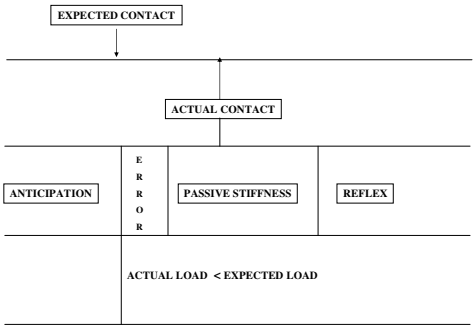
Examples : postural responses



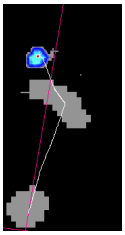
Project 6







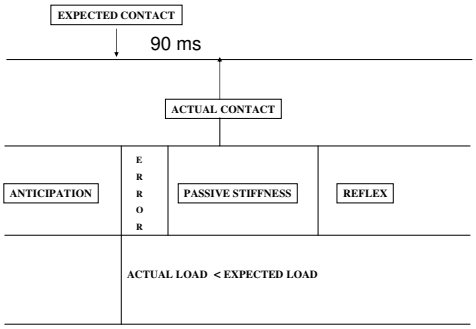
- Lowering of support surface
- Lower visual field occluded
- Cadence standardized
- Infrared beam to detect expected foot contact
- Pressure plate detects touchdown



Protocol

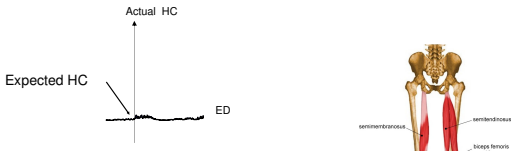
Expected Level	EL	EL 1… EL 10
Unexpected Level	UL	UL 1…. UL 7-10 UD 1, UL 1…. UL 7-10 UD 2, UL 1…. UL 7-10 : UD 10
Unexpected Down	UD	
Expected Down	ED	ED 1 … ED 10

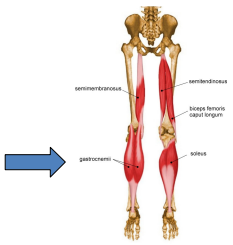
CONTROL subject HH 44 y



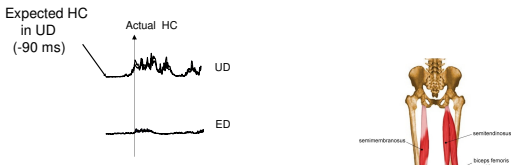
Young adults

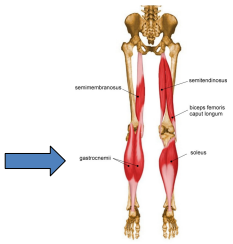
Medial Gastrocnemius



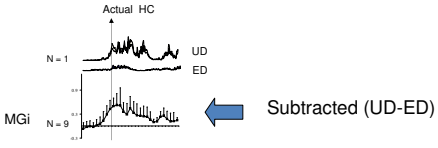


Medial Gastrocnemius





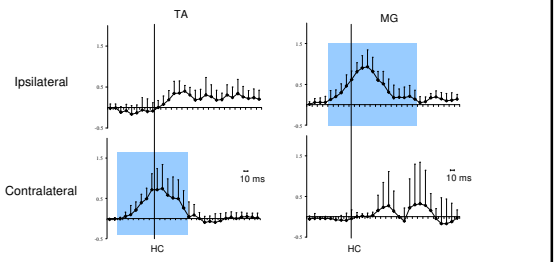
Medial Gastrocnemius



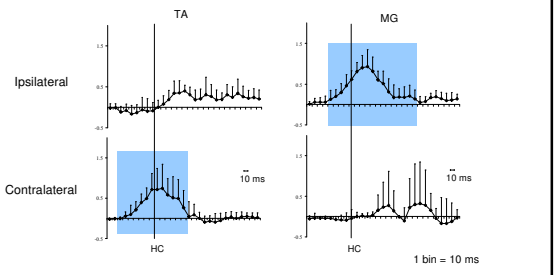
Subtracted (UD-ED)

Extra activation starting some 40 ms
after passing through the expected contact level

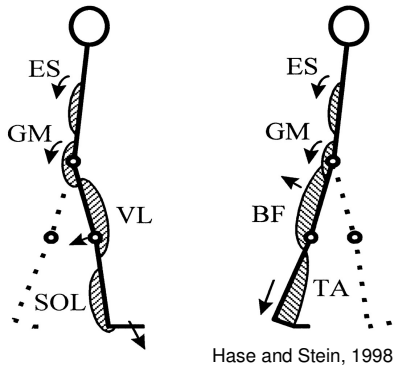
Similar responses are seen in the contralateral TA



Similar responses are seen in the contralateral TA



Functional significance?



Hase and Stein, 1998

Do these fast responses depend on fast afferents?

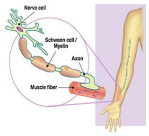
Experiments on adults

-age-matched controls

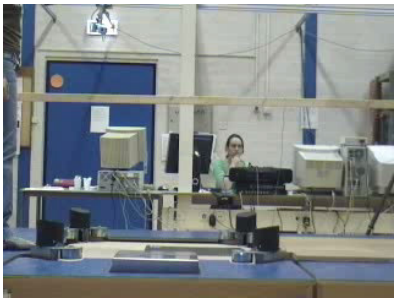
-hereditary motor and sensory neuropathy; HMSNIa

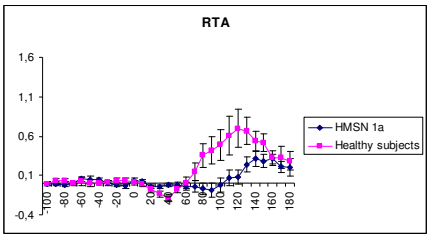
Project 6: Hereditary motor and sensory neuropathy

Why frequent falls?

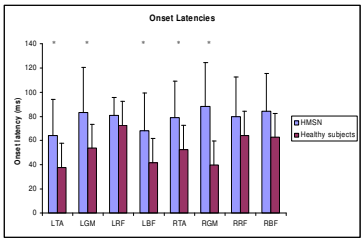


HMSNIa subjectRM 44y





Onset latencies of the responses after expected contact were increased in the HMSNIa patient group



Co-workers:

M. Van der Linden
P.H.J.A. Nieuwenhuijzen
V. Weerdesteyn
C. Bastiaanse
C. Grüneberg
B. Smits-Engelsman
G.P. van Galen,
B. Nienhuis,
B. Groen,
R. Den Otter
I. Schillings
C. Hofstad

The End