Treatment of spasticity and use of gait analysis in rehabilitation practice
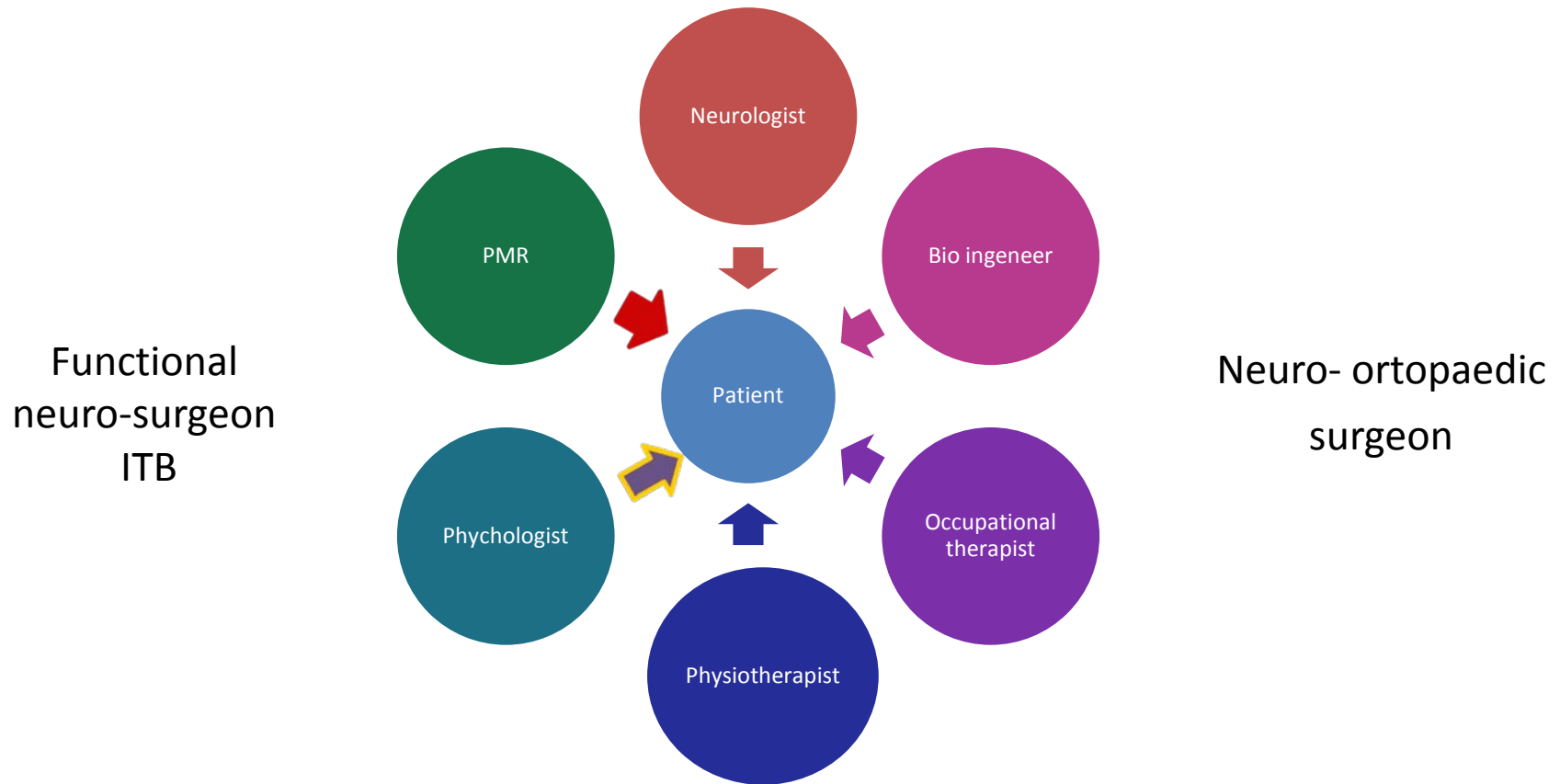
Castagna Anna, MD

Fondazione IRCCS
Don Carlo Gnocchi IRCCS
Santa Maria Nascente, Milano

Santa Maria Nascente Milano,

EPR 17-18 November 2016

Multidisciplinary, tailored, goal related approach

Functional neuro-surgeon ITB

Neuro- ortopaedic surgeon

Neurologist

Bio ingeneer

PMR

Patient

Phychologist

Occupational therapist

Physiotherapist

Rehabilitation Team

Treatment Goals

Improved	Decreased
ROM	Energy expenditure
Mobility	Spasm frequency
Gait	Pain
Orthotic fit	Caregiver burden
Positioning	
Ease of hygiene	
Cosmesis	

Therapy of spasticity (Ward,1995)

GENERAL

BACLOFEN IT

Oral theraphy

FKT

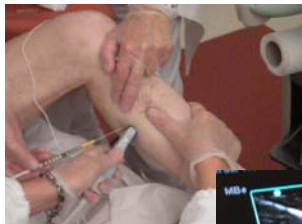Motor learning techniques

Neuromodulation

Rizotomy

Neurotomy

REVERSIBLE
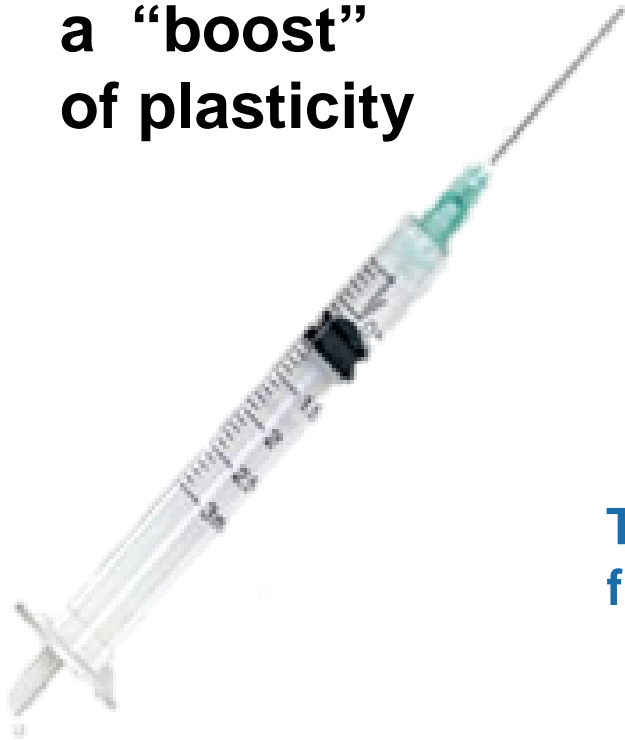
PERMANENT

BoNT-A Phenolic blocks

Functional surgery

Soft tissue treatment

(release, transfer,)

Demolitive surgery

(tenotomy, bone surgery)

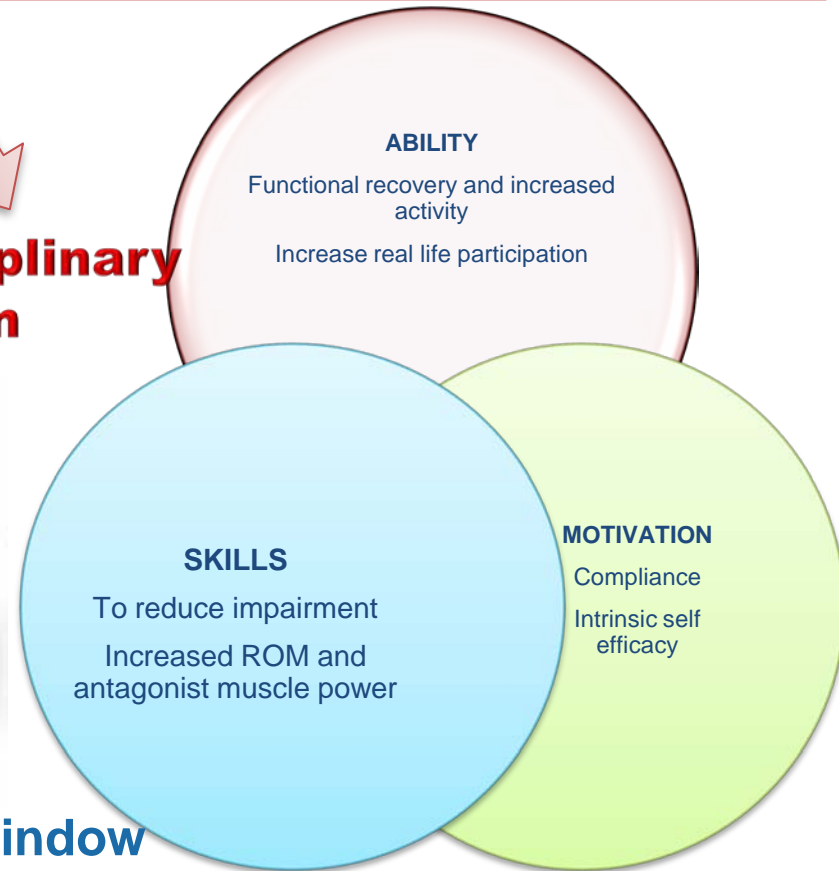**LOCAL**

Botulinum toxin associated with learning goals

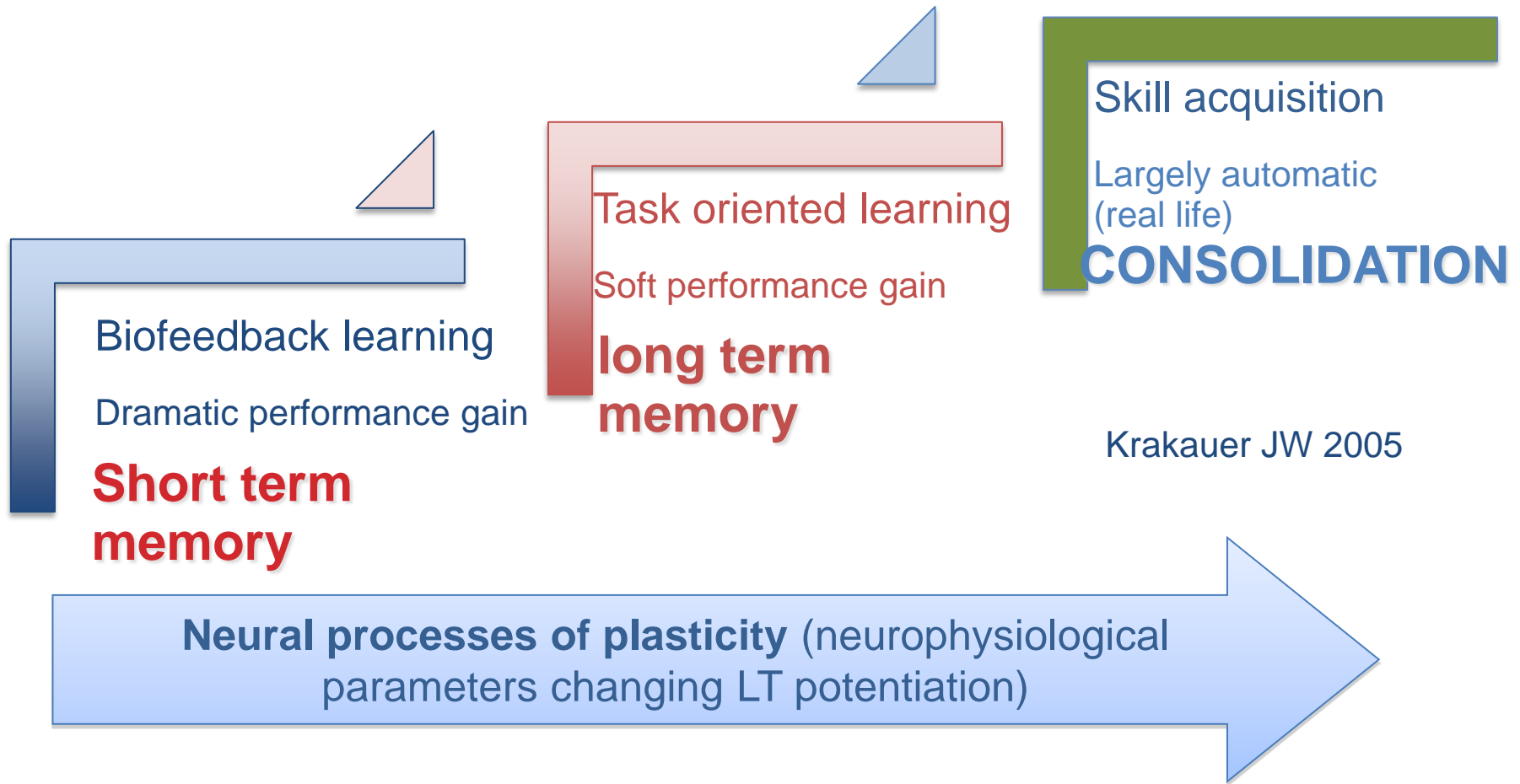**BoNT causes every time a "boost" of plasticity**

Multidisciplinary team

ABILITY

Functional recovery and increased activity

Increase real life participation

SKILLS

To reduce impairment

Increased ROM and antagonist muscle power

MOTIVATION

Compliance

Intrinsic self efficacy

Therapeutic window for learning process

Learning process

Skill acquisition

Largely automatic (real life)
CONSOLIDATION

Task oriented learning

Soft performance gain

long term memory

Krakauer JW 2005

Biofeedback learning

Dramatic performance gain

Short term memory

Neural processes of plasticity (neurophysiological parameters changing LT potentiation)

SAFLo
Movement analysis Laboratory

Simultaneous recording of movement to collect multiple data of full 3D total body analysis - Kinematics - Kinetics - EMG

SMART system (BTS s.p.a., Milan, Italy)

2 TV cameras for video taping

16 channels

LAMB protocol Rabuffetti, Crenna (2004)

2 dynamometric platforms (Kiesler)

8 TV cameras optoelectronic system

GAIT ANALYSIS: why, when, how, in patients affected by spasticity

- Spasticity: post **Stroke**, CP, MS, TBI, genetic paraparesis
- Different goals depending on the rehabilitation programme involving the patient

Why, when, how instrumented analysis

- Quantitative data are useful for functional diagnostic accuracy and decision making pre treatment and follow up (drugs, BoNT, Rehabilitation programmes)
- EMG mapping is useful for Botulinum Toxin targeting
- Dynamic data are important before "weaken" muscles
- Can be a repetitive quantitative measure of outcome
- Mandatory in pitfalls analysis
- Recommended before functional surgery (child and adult), mandatory in US
- Data collection in a experimental context for transational research and scientific publications

2015 EJPR

Does gait analysis change clinical decision-making in poststroke patients? Results from a pragmatic prospective observational study

M. FERRARIN, M. RABUFFETTI, M. BACCHINI, A. CASIRAGHI, A. CASTAGNA, A. PIZZI, A. MONTESANO

49 pts

Review

Efficacy of clinical gait analysis: A systematic review

Tishya A.L. Wren [a,b,*], George E. Gorton III [c], Sylvia Õunpuu [d], Carole A. Tucker [e]

[a] Children's Orthopedic Center, Children's Hospital Los Angeles, Los Angeles, CA, United States
[b] Departments of Orthopaedics, Radiology, and Biomedical Engineering, University of Southern California, Los Angeles, CA, United States
[c] Shriners Hospitals for Children®, Springfield, MA, United States
[d] Connecticut Children's Medical Center, Farmington, CT, United States
[e] Temple University, Philadelphia, PA, United States

The Impact of Instrumented Gait Analysis on Surgical Planning: Treatment of Spastic Equinovarus Deformity of the Foot and Ankle

David A. Fuller, M.D.[*]; Mary Ann E. Keenan, M.D.[**]; Alberto Esquenazi, M.D.[**]; John Whyte, M.D., Ph.D.[**]; Nathaniel H. Mayer, M.D.[**]; Rebecca Fidler-Sheppard[**]
Philadelphia, PA

Considering the different types of therapeutic options, the one with the lowest level of agreement between pre- and post-GA recommendations was surgery ($8/46=17\%$) followed by BT ($49/118=42\%$), orthosis ($5/8=63\%$) and physiotherapy ($84/104=81\%$). This result indicates that the detailed data provided by GA on joint kinematic/kinetic and on muscle activation patterns are particularly useful and add significant information for detailed interventions, like surgery or BT, that address specific anatomical elements, as also reported by other authors.[8, 9, 12, 24] It is still to be clarified whether GA data are less important in targeting physiotherapy, or it is more difficult to translate such information into specific therapeutic indications. Another possibility is that the second-level indications for physiotherapy considered in the present study were too generic to be influenced by GA data. Further studies on this aspect should be
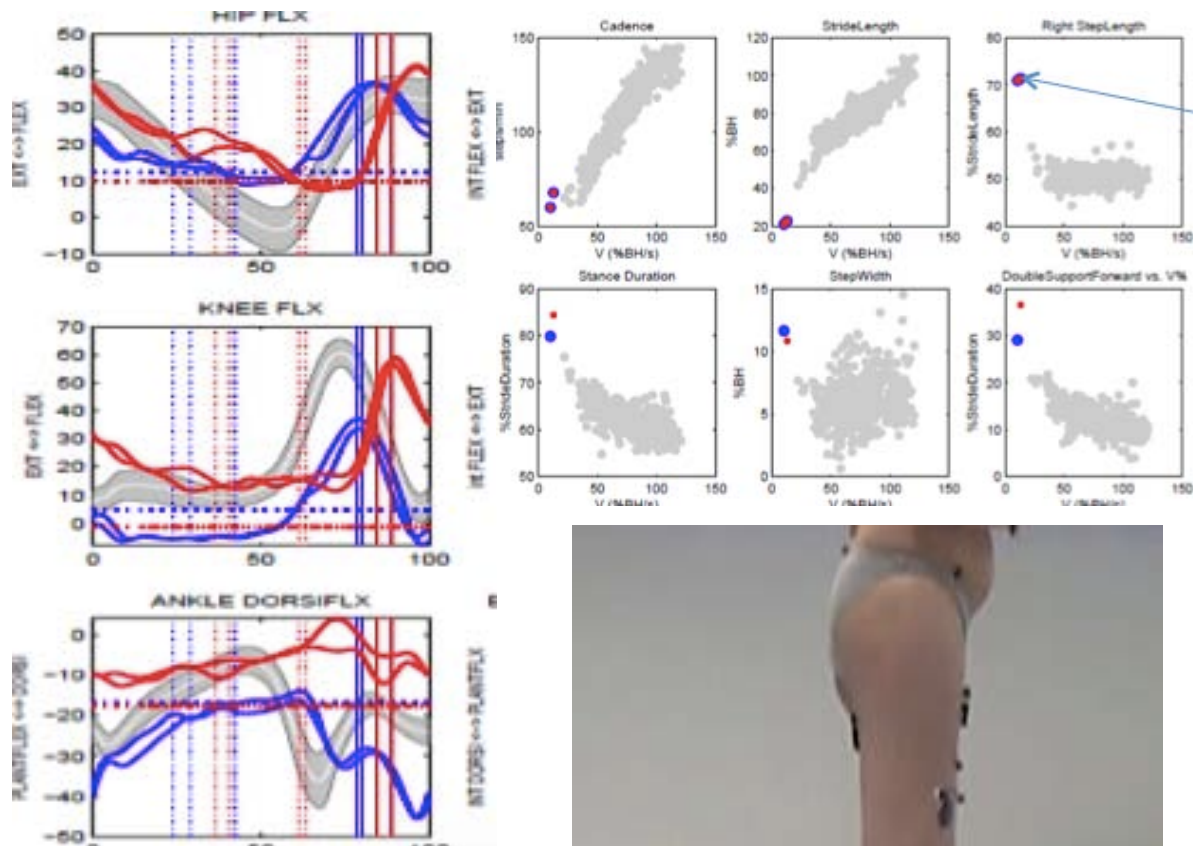
21 years old woman with
L meningioma operation
(4 months after)

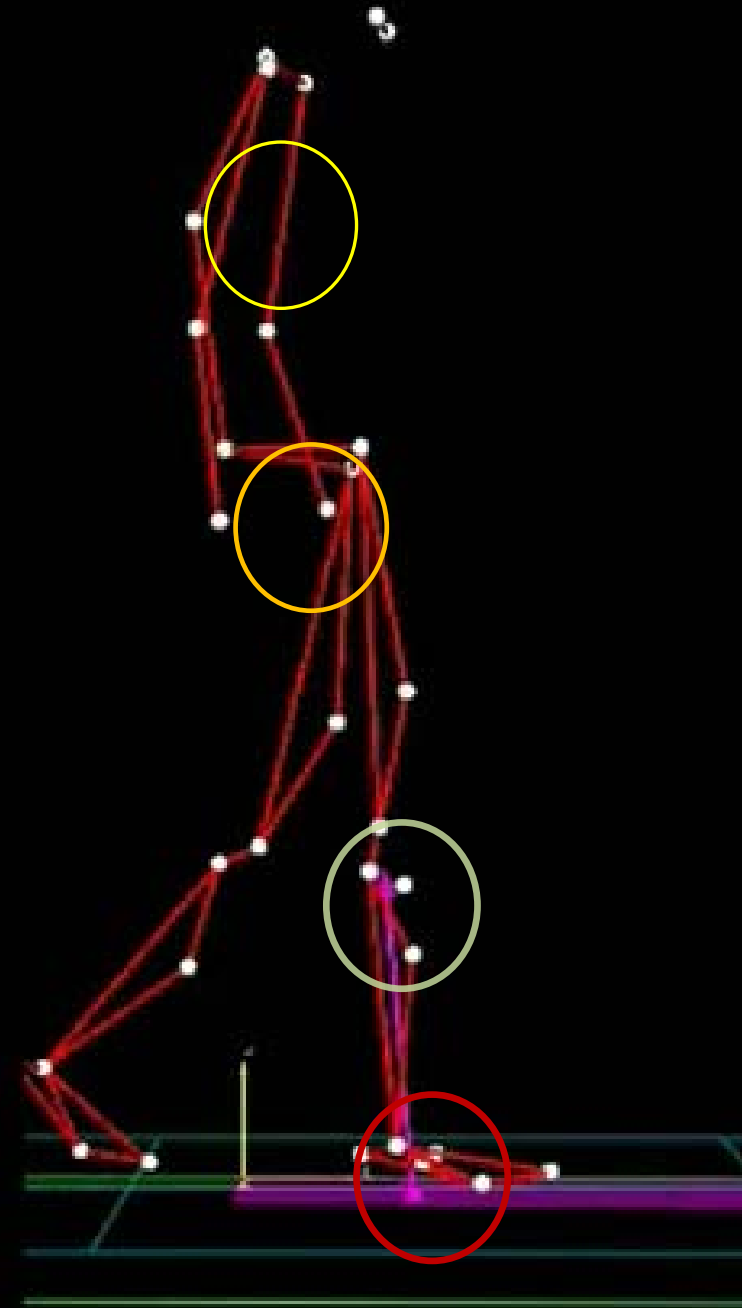•Loss of propulsion
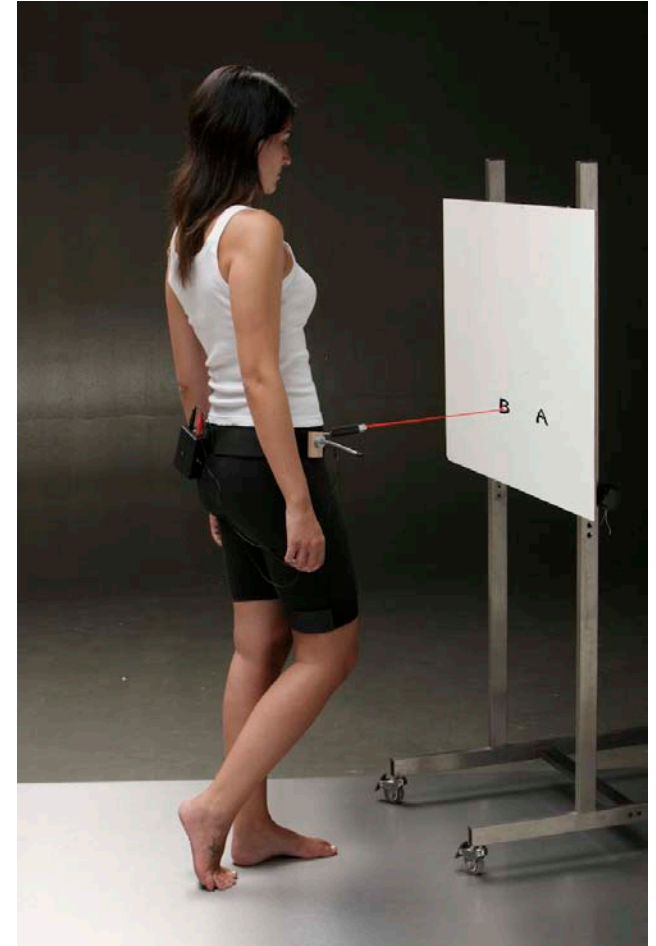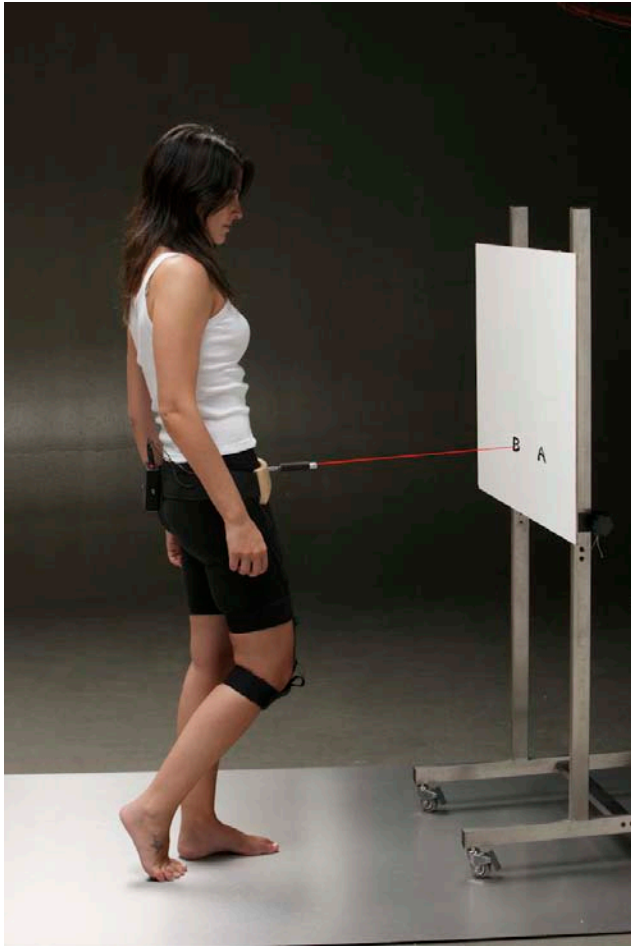•Reduced speed
•Reduced multilevel ROM
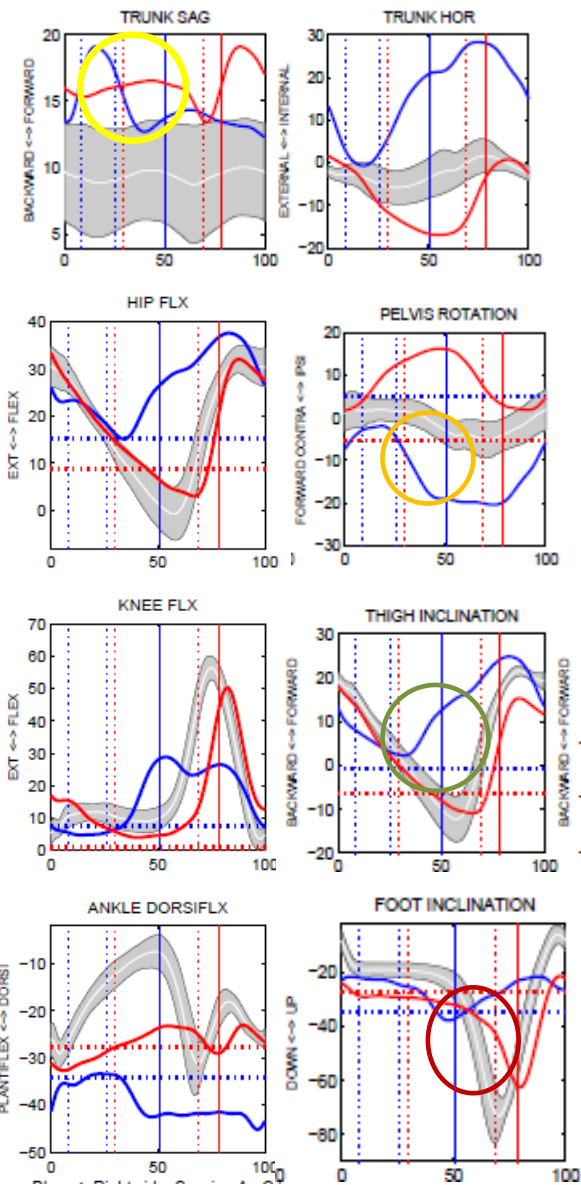
TRUNK CONTROL
PS

HIP FLEXION
ROTATION
PS -PO

KNEE FLEX /EXT
LEG
 INCLINATION

HEEL RISE

Therapy: positional biofeedback

Post: Tstance

Post: push off

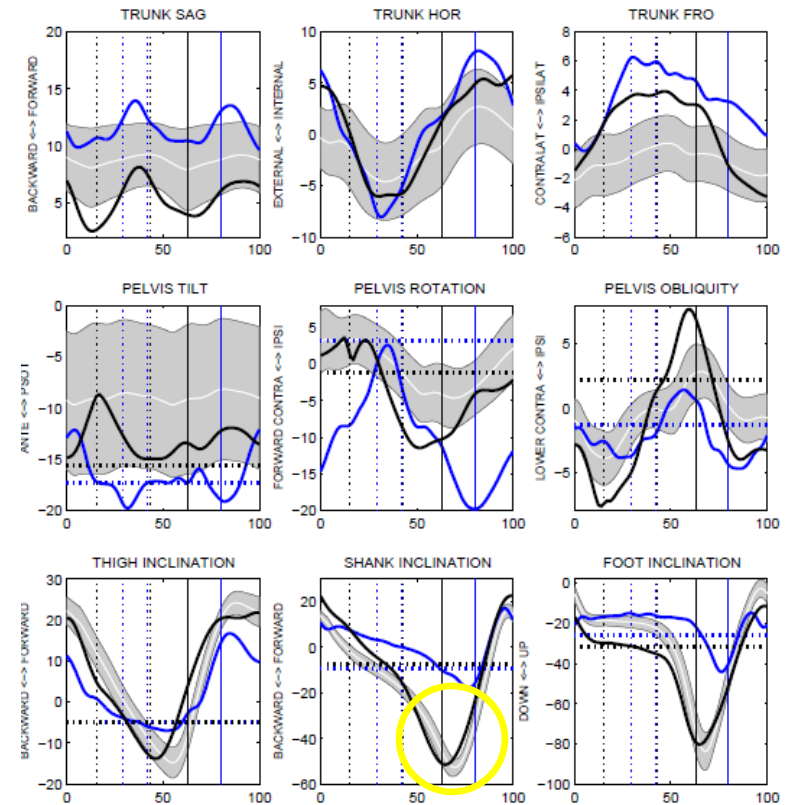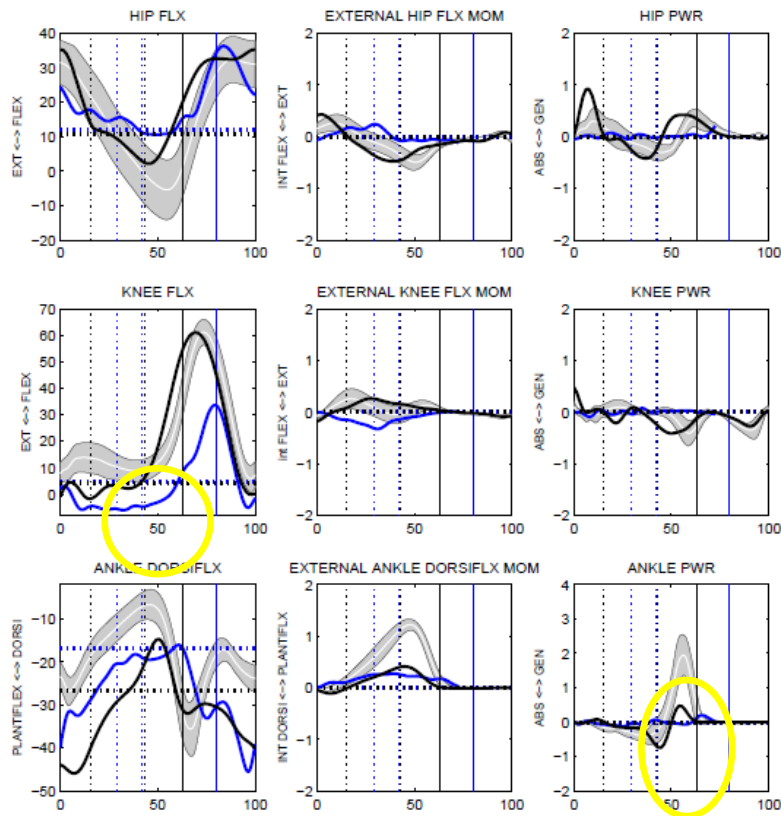# Kinematic and kinetic data on sagittal plane (Pre blu, Post black)

THANK YOU FOR YOUR ATTENTION