



Clinical cases

Practical Session of the course

"Basics in Motion Analysis" - TRAMA Network Project

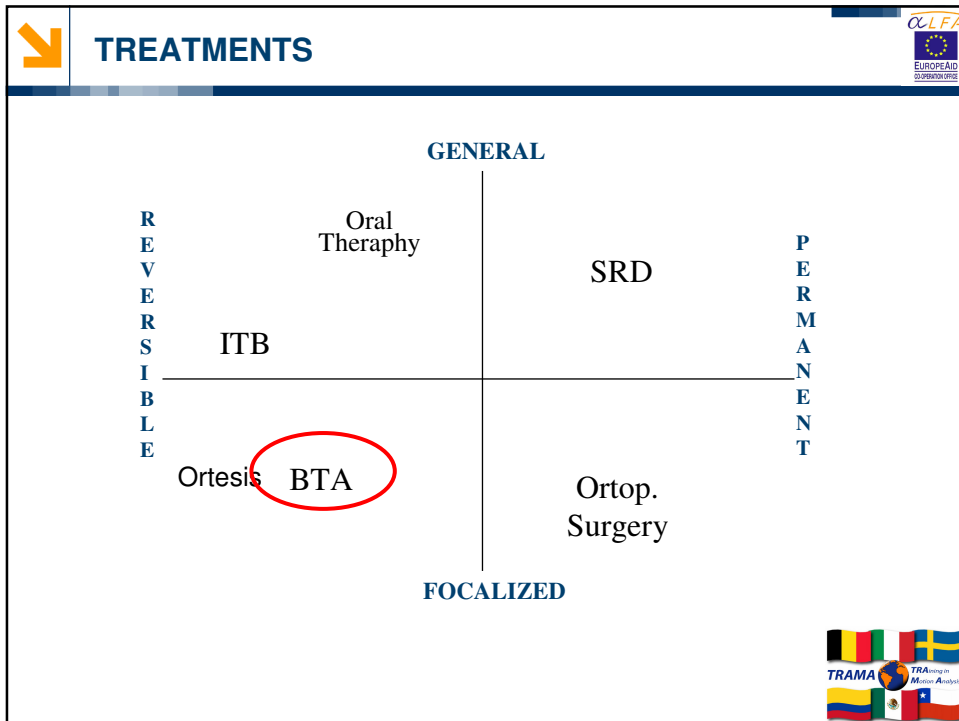
13- 21st September 2007



Case study R.S.

**Quantitative evaluation of effects of
Botulinum Toxin injection in a patient
with Cerebral Palsy**

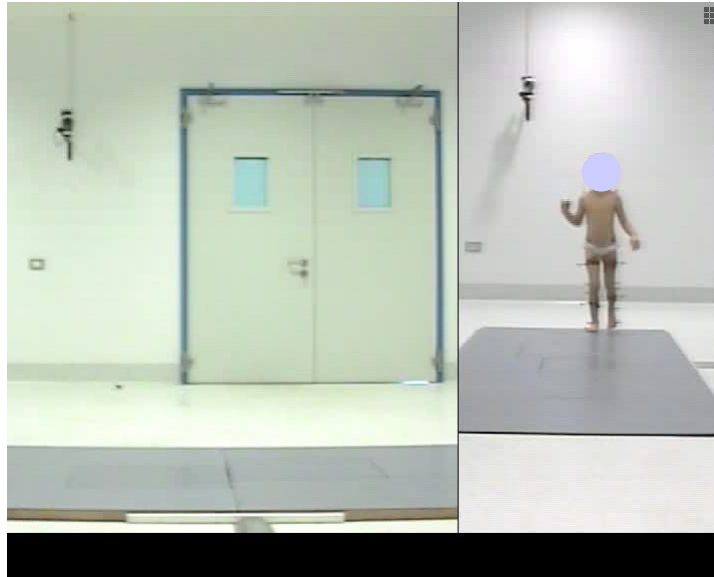




- Case study (R.S.): Patient presentation**
- ✓ She is 4 years old
 - ✓ CP - Spastic diplegia
 - ✓ MRI: Periventricular leucomalacia
 - ✓ She started walking at 18 months
 - ✓ She is an independent ambulator without the use of orthoses or assistive devices
 - ✓ She had no previous surgical or pharmacological treatment
 - ✓ She has ongoing physical therapy



Case study (R.S.): Video recording



Case study (R.S.): physical examinations PRE session



Gross Motor Function Measure (GMFM)

It is standardised instrument to measure changes in gross motor function over time in children with CP

Evaluation of child's overall functional abilities

88 items inside 5 dimensions

DIMENSION A: Lying and rolling

DIMENSION B: Sitting

DIMENSION C: Crawling and kneeling

DIMENSION D: Standing

DIMENSION E: Walking, running and jumping

TOTAL SCORE (MEAN %)





G.M.F.M.	
Total score	246
% dimension A	100
% dimension B	100
% dimension C	100
% dimension D	92
% dimension E	79
% MEAN	94.2



ASHWORTH SCALE

Description of muscle tone scores 0-5

- 0 - no increase in muscle tone
- 1 - slight increase in tone with a catch and release or minimal resistance at end of range
- 2 - as 1 but minimal resistance through range following catch
- 3 - more marked increase tone through ROM
- 4 - considerable increase in tone, passive movement difficult
- 5 - affected part is rigid in flexion or extension

ASHWORTH	Right side	Left side
Hip flexors	0	0
Hip adductors	2	2
Knee flexors	2	2
Knee extensors	0	2
Ankle plantarflexors	1	2
MEAN	1	1.6


CLONUS SCALE	
Right side	Left side
0	0



Case study (R.S.): Gait Analysis

Gait Analysis

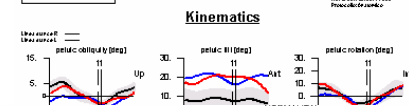
- R.S. was asked to walk at natural speed, barefoot and without any devices
- 8 trials were acquired → we chose 1 trial that was consistent with the others → Kinematics (right vs left side) and synchronic video recording



Case study (R.S.): Gait Analysis
PRE session

BTS - EliteClinic
IRCCS "Eugenio Medea" - La Nostra Famiglia Lab

Kinematics




	DX	SX	DX	SX
Parametri temporali				
Stance time [msec]	460	430	437-550	472-635
Swing time [msec]	290	320	350-437	407-465
Stance time [% stride]	61	57	55-57	53-59
Swing time [% stride]	39	43	43-45	41-47
Stride time [msec]	750	750	786-985	880-1090
Cadence [step/min]		160	114-143	114-143
Double supp. time [msec]	70	70	30-50	33-74
Double supp. [% stride]	9	9	4-5	4-8
Parametri di distanza				
Step length [mm]	401	349	608.67-579.54	627.84-573.15
Velocity [m/sec]	1.00	1.05	1.03-1.41	0.85-1.22
Swing velocity [m/sec]	2.59	2.45	2.34-3.16	2.01-2.64
Stride length [mm]	752	785	965.99-1144.03	924.04-1090.10
Step width [mm]		72	65.84-95.35	65.84-95.35
Mean velocity [m/sec]		1.02	0.91-1.32	0.91-1.32

Nome classe: CH...
Descrizione: 2009
22/11/2009

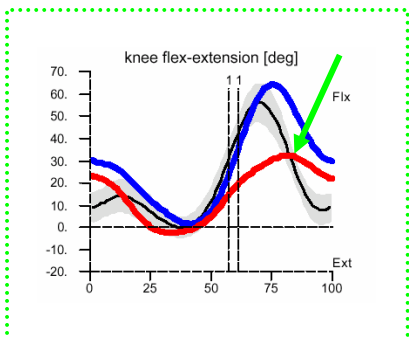
C+D+EMG.REP BTS Bioengineering - EliteClinic - BTS SpA. 1

C+D+EMG.REP BTS Bioengineering - EliteClinic - BTS SpA. 2





Case study (R.S.): Gait Analysis
PRE session



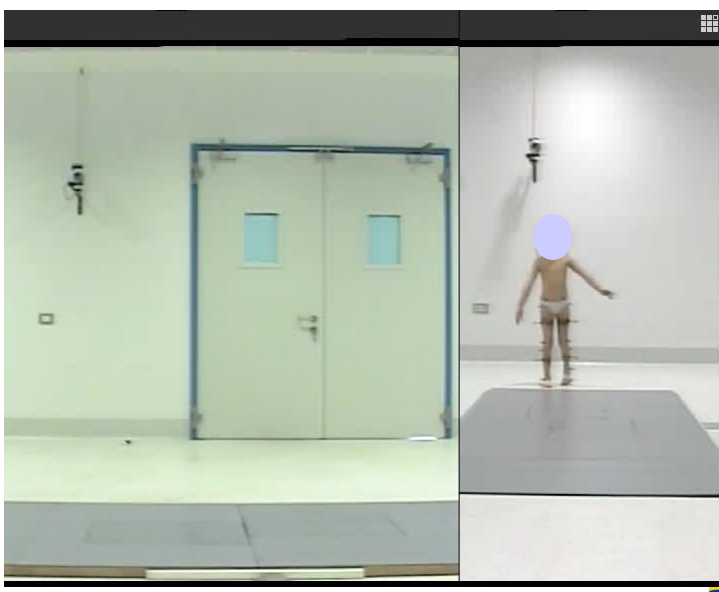
Rectus femoris
spasticity on left side

*Botulinum Toxin inoculation
into left Rectus Femoris*

**Botulinum Toxin inoculation
into left Rectus Femoris
(Botox: 100 U; 2 sites of inoculation)**



Case study (R.S.): Video recording
POST session (1 month)





Case study (R.S.): physical examinations POST session (1 month)



G.M.F.M.	POST	PRE
Total score	256	246
% dimension A	100	100
% dimension B	100	100
% dimension C	100	100
% dimension D	95	92
% dimension E	97	79
% MEAN	97	94

ASHWORTH	POST		PRE	
	right	left	right	left
Hip flexors	0	0	0	0
Hip adductors	2	2	2	2
Knee flexors	2	2	2	2
Knee extensors	0	1	0	2
Ankle plantarflexors	1	2	1	2
MEAN	1	1.4	1	1.6

CLONUS SCALE			
POST		PRE	
right	left	right	left
0	0	0	0



Clinical case (R.S.) POST session

NORMALITA'



PRE session

Parametri temporali	DX	SX	DX	SX
Stance time [msec]	460	430	437-550	472-635
Swing time [msec]	290	320	300-437	407-465
Stance time [% stride]	61	57	55-57	53-59
Swing time [% stride]	36	43	43-45	41-47
Stride time [msec]	750	750	788-965	880-1090
Cadence [step/min]		160	114-143	114-143
Double supp. time [msec]	Fw.Dx: 70	Fw.Sx: 70	Fw.Dx: 30-50	Fw.Sx: 33-74
Double supp. [% stride]	9	9	4-5	4-8

POST session

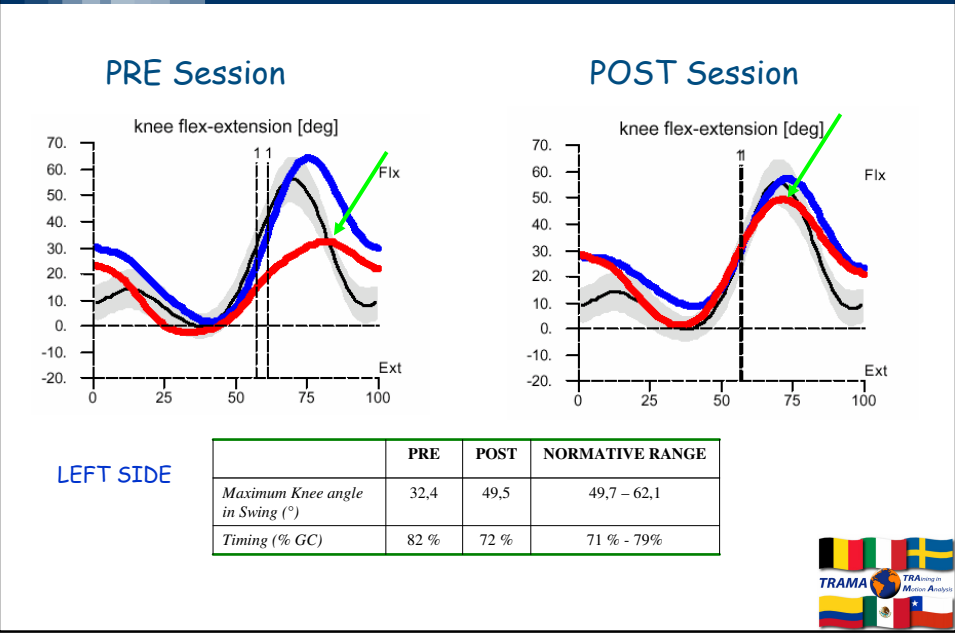
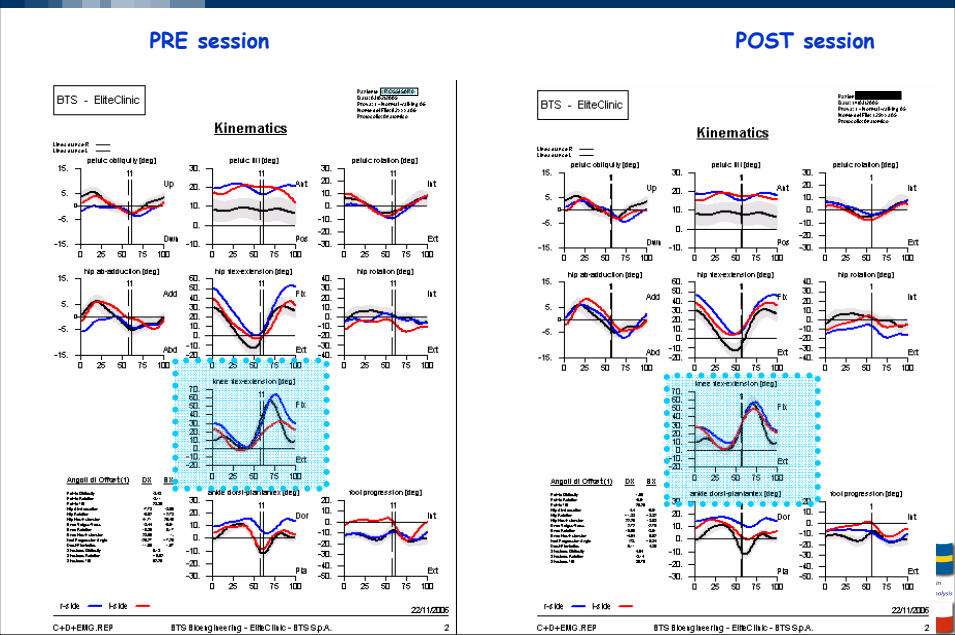
Parametri di distanza	DX	SX	DX	SX
Step length [mm]	401	349	508.67-579.54	527.84-573.15
Velocity [m/sec]	1.00	1.05	1.03-1.41	0.85-1.22
Swing velocity [m/sec]	2.59	2.45	2.34-3.18	2.01-2.64
Stride length [mm]	752	788	966.99-1144.03	924.04-1090.10
Step width [mm]	111	77	65.84-95.35	65.84-95.35
Mean velocity [m/sec]	1.02		0.91-1.32	0.91-1.32

NORMALITA'

Parametri temporali	DX	SX	DX	SX
Stance time [msec]	360	360	437-550	472-635
Swing time [msec]	270	280	350-437	407-465
Stance time [% stride]	57	56	55-57	53-59
Swing time [% stride]	43	44	43-45	41-47
Stride time [msec]	630	640	788-965	880-1090
Cadence [step/min]		189	114-143	114-143
Double supp. time [msec]	Fw.Dx: 50	Fw.Sx: 40	Fw.Dx: 30-50	Fw.Sx: 33-74
Double supp. [% stride]	8	6	4-5	4-8

Parametri di distanza	DX	SX	DX	SX
Step length [mm]	350	289	508.67-579.54	527.84-573.15
Velocity [m/sec]	1.00	0.99	1.03-1.41	0.85-1.22
Swing velocity [m/sec]	2.34	2.27	2.34-3.18	2.01-2.64
Stride length [mm]	633	636	966.99-1144.03	924.04-1090.10
Step width [mm]	111	77	65.84-95.35	65.84-95.35
Mean velocity [m/sec]	1.00		0.91-1.32	0.91-1.32







Gait Analysis has been crucial in order:

⌘ to have additional information in the decision-making process

⌘ to quantify the effects of treatment

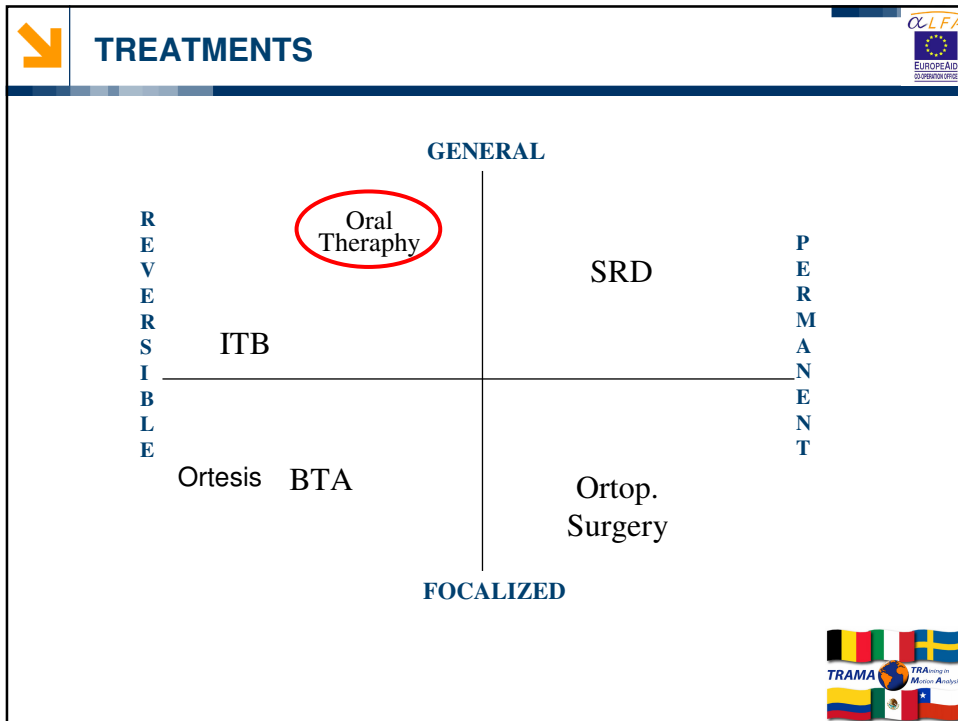
⌘ to simulate the effects of rectus femoris transfer



Case study A.P.

**Quantitative evaluation of effects of
Levodopa treatment in a patient
with Parkinson's disease**

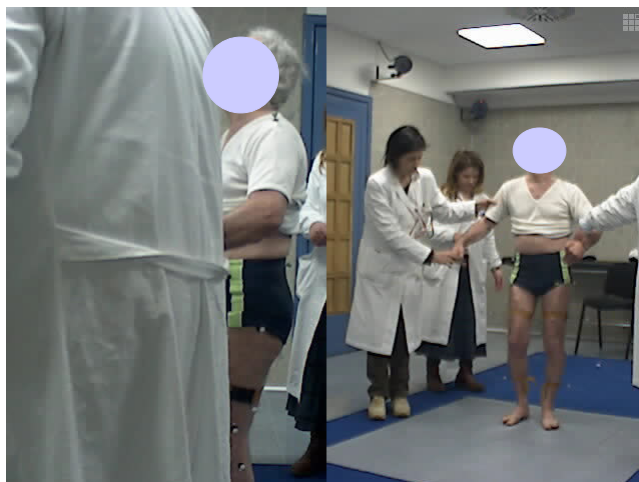




Case study (A.P.): Patient presentation

- ✓ He is 69 years old
- ✓ He is affected by Parkinson's disease
- ✓ He was evaluated in **OFF state** (without pharmacological treatment) and in **ON state** (50 minutes after taking an appropriate oral dose of Levodopa)

Case study (A.P.): Patient video recording
OFF state



Case study (A.P.): Gait Analysis
OFF state



Laboratorio di Analisi del Movimento

IRCCS "San Raffaele Cassino" - Tosinvest Sanità

NOME: [REDACTED]
COGNOME: [REDACTED]
DATA DI NASCITA: [REDACTED]
PATOLOGIA: [REDACTED]

Parametri temporali

NORMALITA'

	DX	SX	DX	SX
STANCE PHASE (%)	69.1	91	59.6 ± 1.2	59.3 ± 1.8
SWING PHASE (%)	30.9	9	40.4 ± 1.2	40.7 ± 1.8
DOUBLE SUPPORT (%)	36.8	23.9	13.4 ± 1.1	8.3 ± .6
STANCE PHASE (s)	0.39	0.51	0.63 ± .02	0.63 ± .04
SWING PHASE (s)	0.17	0.05	0.43 ± .02	0.43 ± .02
STRIDE TIME (s)	0.57	0.56	1.06 ± .03	1.05 ± .05
CADENCE (step/min)	213.345		113.844 ± 4.302	

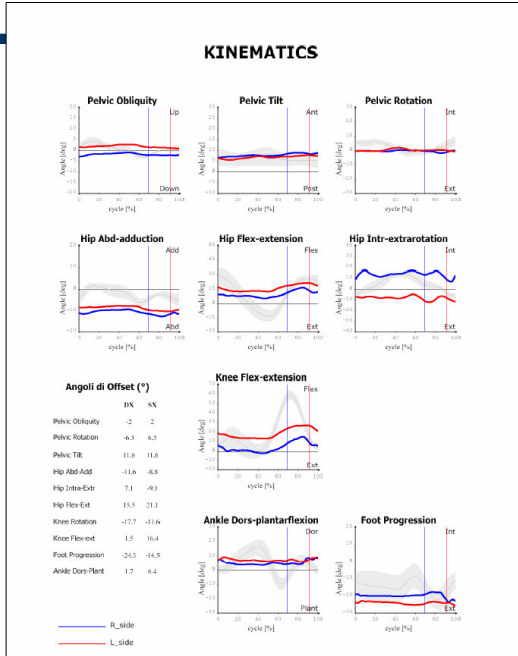
Parametri di distanza

NORMALITA'

	DX	SX	DX	SX
STEP LENGTH (m)	0.01	0.03	0.62 ± 0	0.74 ± .02
VELOCITY (m/s)	0.07	0.05	1.33 ± .06	1.33 ± .07
SWING VELOCITY (m/s)	0.24	0.48	3.3 ± .14	3.27 ± .18
STRIDE LENGTH (m)	0.05	0.03	1.4 ± .07	1.4 ± .06
STEP WIDTH (m)	0.22	0.22	0.11 ± .03	0.13 ± .01
MEAN VELOCITY (m/s)	0.08		1.33 ± .06	



Case study (A.P.): Gait Analysis
OFF state



Case study (A.P.): patient video recording
ON state



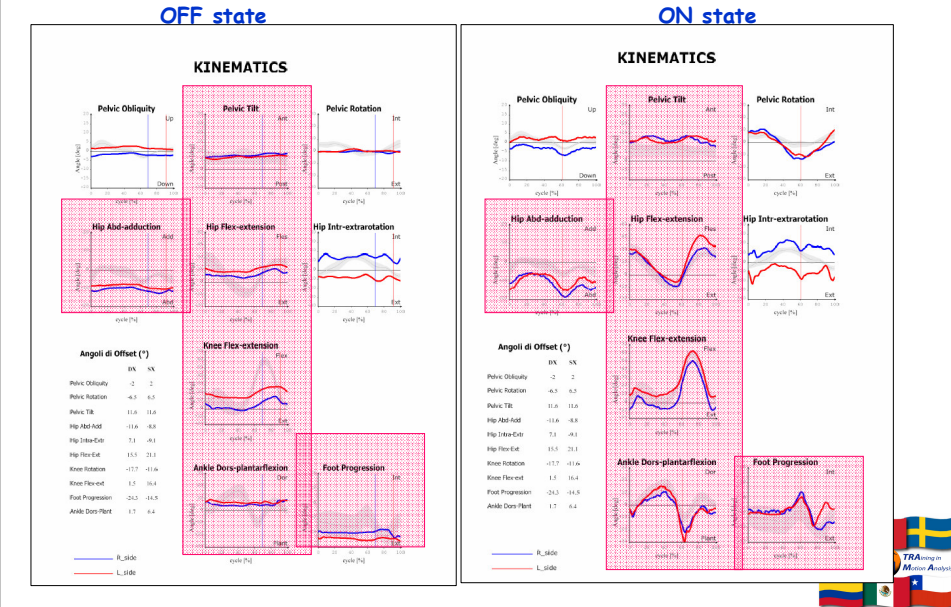
Case study (A.P.): Gait Analysis ON state




OFF state				ON state			
<p>Laboratorio di Analisi del Movimento IRCCS "San Raffaele Cassino" - Tosinvest Sanità</p> <p>NOME: [REDACTED] COGNOME: [REDACTED] DATA DI NASCITA: [REDACTED] PATOLOGIA: [REDACTED]</p>				<p>Laboratorio di Analisi del Movimento IRCCS "San Raffaele Cassino" - Tosinvest Sanità</p> <p>NOME: [REDACTED] COGNOME: [REDACTED] DATA DI NASCITA: [REDACTED] PATOLOGIA: [REDACTED]</p>			
Parametri temporali		NORMALITA'		Parametri temporali		NORMALITA'	
	DX SX	DX SX	DX SX		DX SX	DX SX	DX SX
STANCE PHASE (%)	59.1 51	59.6 ± 1.2 59.3 ± 1.8		50.7 60.5	59.6 ± 1.2 59.3 ± 1.8		
SWING PHASE (%)	30.9 49	40.4 ± 1.2 40.7 ± 1.8		39.3 39.5	40.4 ± 1.2 40.7 ± 1.8		
DOUBLE SUPPORT (%)	36.8 23.9	13.4 ± 1.1 8.3 ± 0.6		9.7 10.9	13.4 ± 1.1 8.3 ± 0.6		
STANCE PHASE (s)	0.39 0.51	0.63 ± 0.02 0.63 ± 0.04		0.73 0.74	0.63 ± 0.02 0.63 ± 0.04		
SWING PHASE (s)	0.17 0.05	0.43 ± 0.02 0.43 ± 0.02		0.48 0.48	0.43 ± 0.02 0.43 ± 0.02		
STRIDE TIME (s)	0.57 0.56	1.06 ± 0.03 1.05 ± 0.05		1.21 1.23	1.06 ± 0.03 1.05 ± 0.05		
CADENCE (step/min)	213.345	113.844 ± 4.302		96.635	113.844 ± 4.302		
Parametri di distanza		NORMALITA'		Parametri di distanza		NORMALITA'	
	DX SX	DX SX	DX SX		DX SX	DX SX	DX SX
STEP LENGTH (m)	0.01 0.03	0.62 ± 0 0.74 ± 0.02		0.55 0.57	0.62 ± 0 0.74 ± 0.02		
VELOCITY (m/s)	0.07 0.05	1.33 ± 0.06 1.33 ± 0.07		1.01 1.08	1.33 ± 0.06 1.33 ± 0.07		
SWING VELOCITY (m/s)	0.24 0.48	3.3 ± 0.14 3.27 ± 0.18		2.27 2.44	3.3 ± 0.14 3.27 ± 0.18		
STRIDE LENGTH (m)	0.09 0.03	1.4 ± 0.07 1.4 ± 0.06		1.22 1.32	1.4 ± 0.07 1.4 ± 0.06		
STEP WIDTH (m)	0.22 0.27	0.11 ± 0.03 0.13 ± 0.01		0.24 0.24	0.11 ± 0.03 0.13 ± 0.01		
MEAN VELOCITY (m/s)	0.06	1.33 ± 0.06		0.94	1.33 ± 0.06		






Case study (A.P.): Gait Analysis ON state






POSTURAL EVALUATION








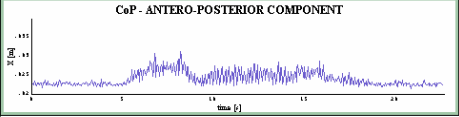


OFF state

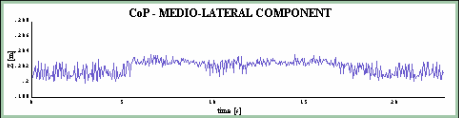
ON state

CoP - ANTERO-POSTERIOR COMPONENT

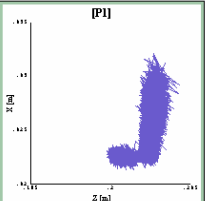


CoP - MEDIO-LATERAL COMPONENT

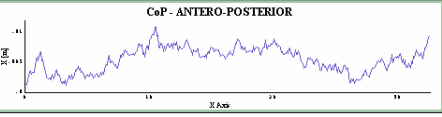


ROM antero-post [m]	0.011
ROM medio-lat [m]	0.005

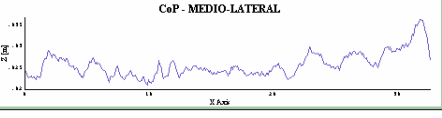
[P1]



CoP - ANTERO-POSTERIOR



CoP - MEDIO-LATERAL



ROM antero-post [m]	0.011
ROM medio-lat [m]	0.016

