



Final Meeting - TRAMA Project
Bogotá, Colombia



**POSTURAL CONTROL IN CHILDREN, TEENAGERS AND
ADULTS WITH DOWN SYNDROME**

Eng. Chiara Rigoldi

Prof. M. CRIVELLINI

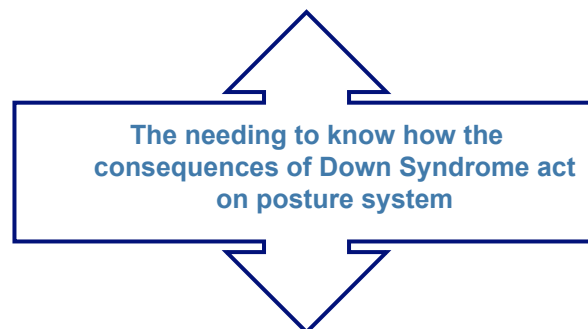
Eng. M. GALLI

Bioeng. Dept. – Politecnico di Milano

AIMS



Postural analysis with the definition and computation
of posture indexes (kinematic, analysis in frequency
and time domain)

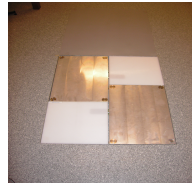


Temporal evolution of typical functional limits in DS
in relation to growth

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INSTRUMENTATIONS



8 (12) TVC

2 VideoController

2 Force plate

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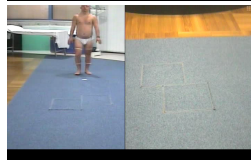
SUBJECTS



37 children
6-11 years



58 teenagers
11-19 years



45 adults
20-40 years

GROWTH

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DATA ACQUISITION



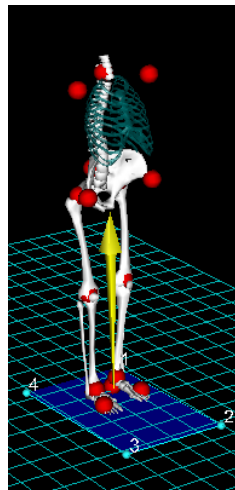
POSTURE TRIALS

22 markers (Davis protocol)

30 s

2 conditions: OE and CE

Resting time: 120 s



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COP: DATA ELABORATION

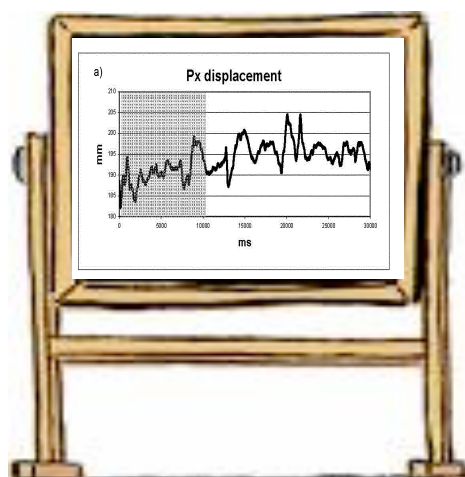


Time domain analysis:

ROM Px (mm)

ROM Py (mm)

TL (mm)



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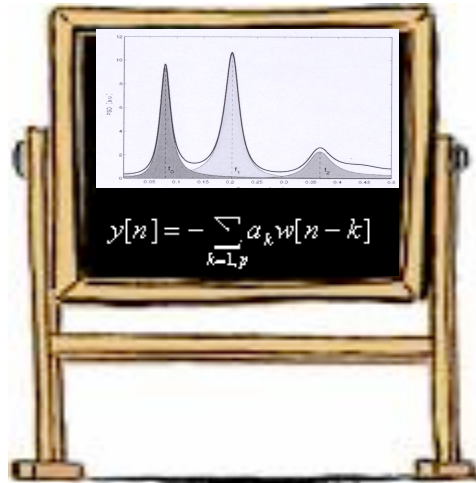
COP: DATA ELABORATION



Frequency domain analysis:

fPx (Hz)

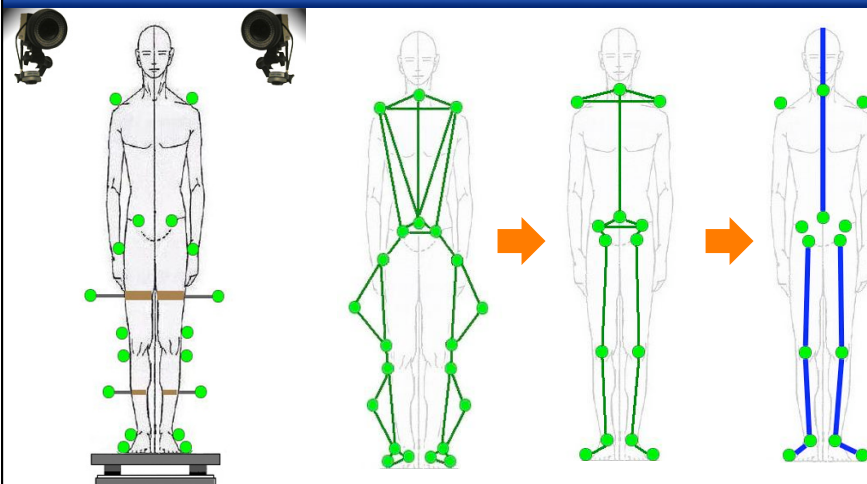
fPy (Hz)



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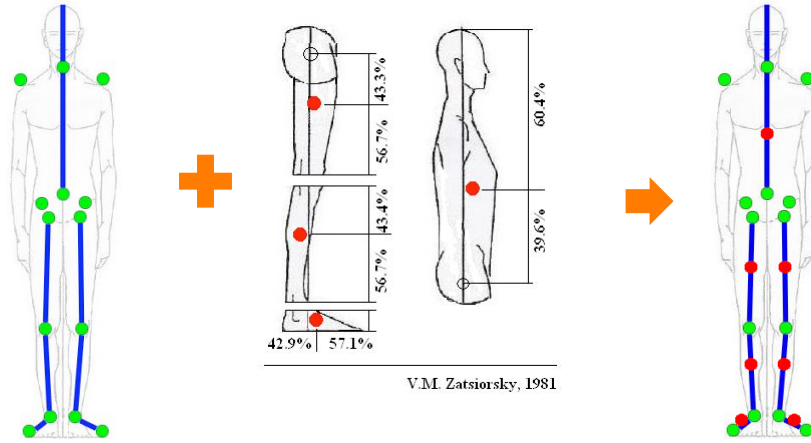
COM COMPUTATION



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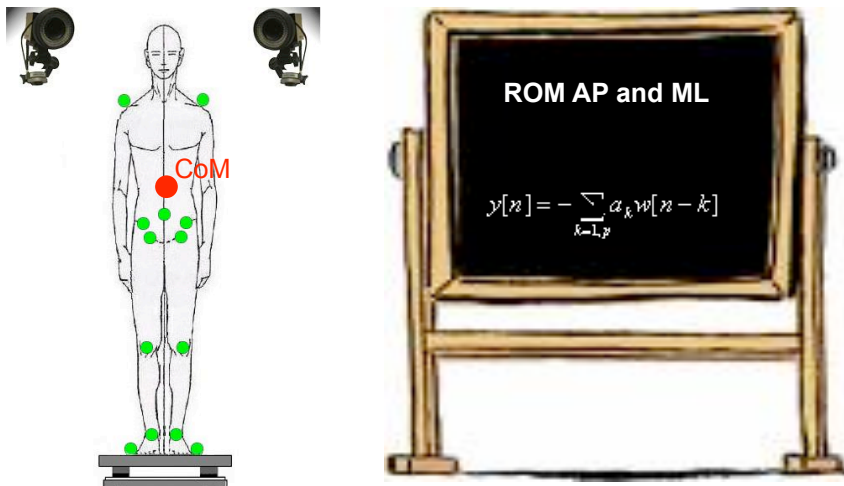
COM COMPUTATION



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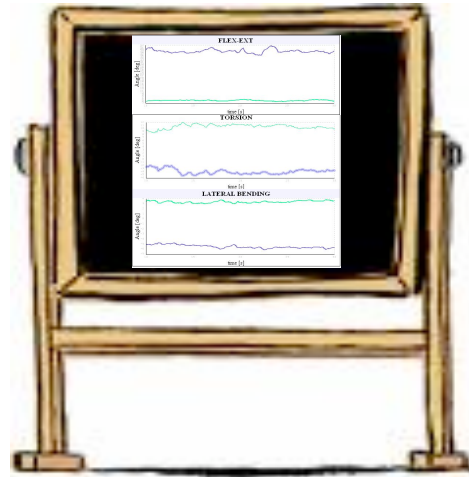
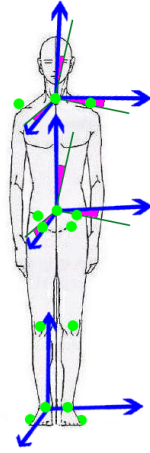
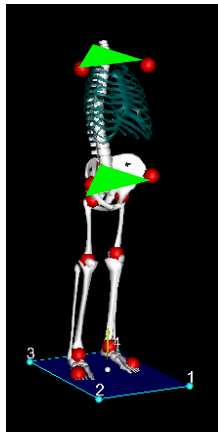
COM: DATA ELABORATION



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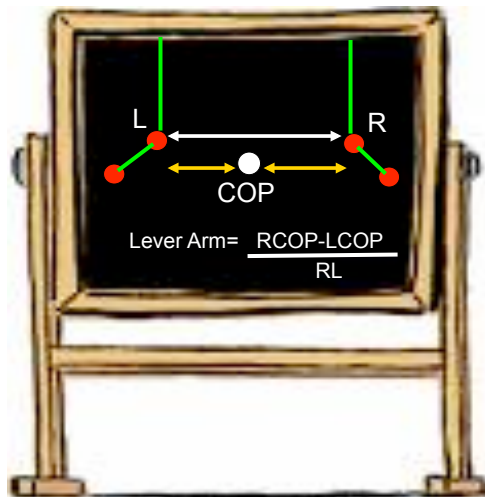
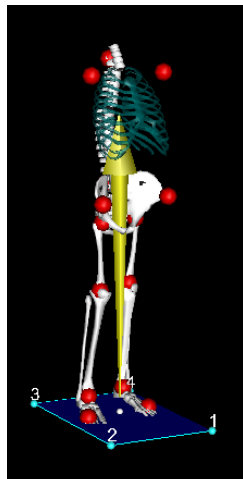
EULER'S ANGLES: COMPUTATION & ELABORATION



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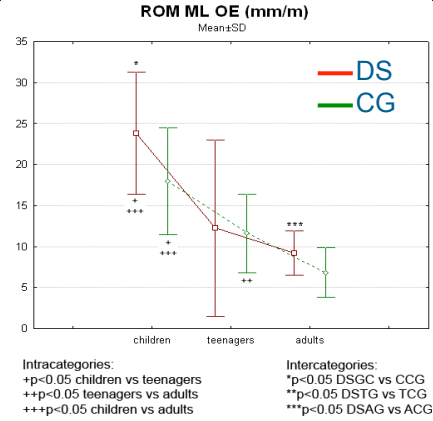
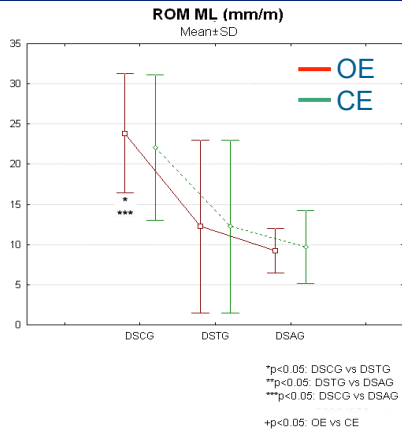
KINEMATIC AND KINETIC: DATA ELABORATION



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RESULTS (1/3)

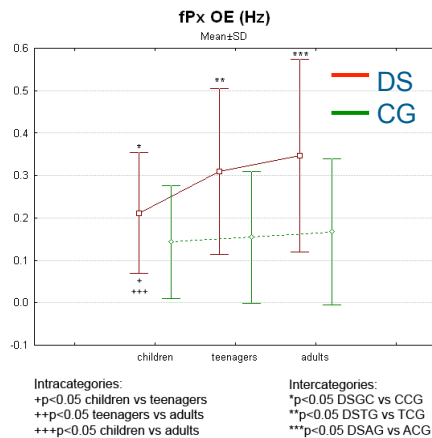
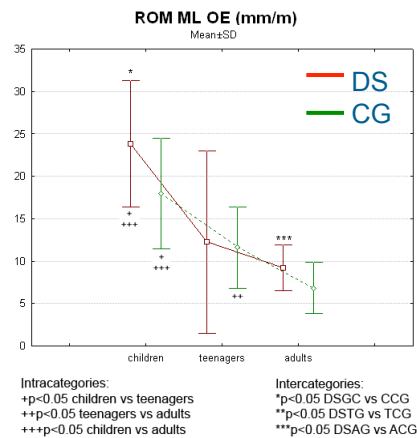


Differences between DS and CG: learning delay
Postural strategies in ML direction improve during growth

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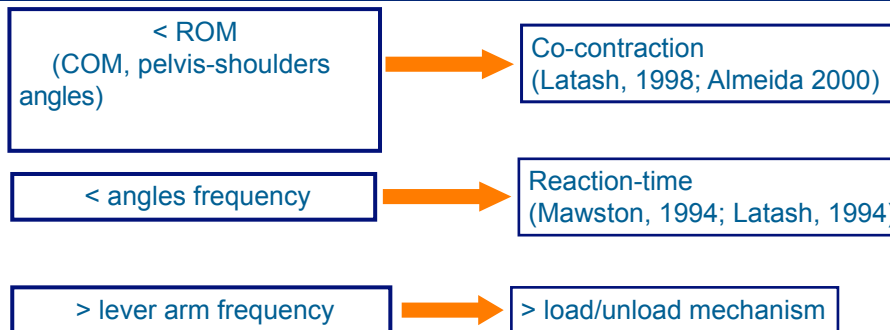
RESULTS (2/3)



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RESULTS (3/3)

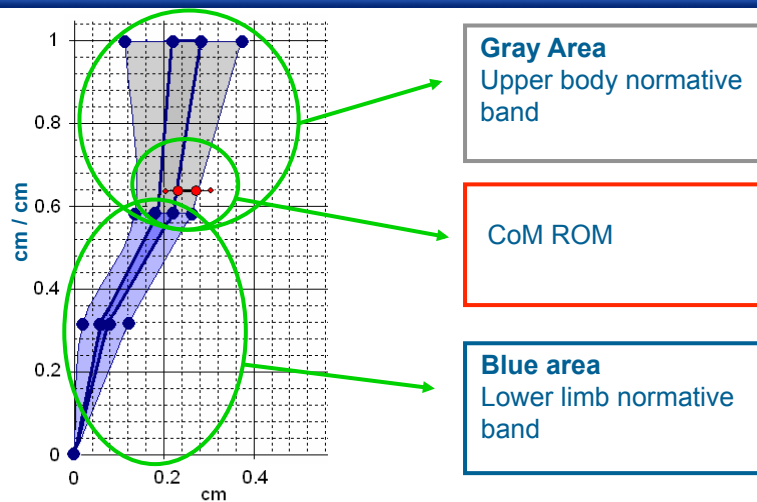


PRECARIOUS BALANCE

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RESULTS: REPORT



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RESULTS: REPORT EXAMPLE



POSTURAL STRATEGY REPORT

Dati Anamnestici

Nome: Valeria
 Patologia: Sindrome di Down
 Età: 11
 Altezza (cm): 131
 Peso (kg): 55

Medici

Medico richiedente:
 Medico specialista:

Resort

Tipo di prova: Postura statica
 Data: 22/06/2006
 Nome del File: 2805a01
 Database normalità: COG6
 Protocollo: Anatomico
 Note: 30 secondi occhi aperti
 30 secondi occhi chiusi

Protocollo CoM-Matilde FFP 01.00/2007 -1-

INDICI POSTURALI STRATEGY

	PAZIENTE		NORMALITÀ	
	FRVA RA	FRVA RC	FRVA RA	FRVA RC
DATI DI IDENTIFICAZIONE				
1.1 ROM COP AP (mm)	21342	26639	1424 +6.384	16772 +7.575
1.2 ROM COP ME (mm)	20658	19277	17928 +6.54	19413 +6.515
1.3 TL (mm)	132741	139576	345795 +1451.201	4265729 +1353.091
1.4 # COP AP (°)	0.8620	0.42	3.01 +0.265	0.222 +0.204
1.5 # COP ME (°)	0.3493	0.57	0.43 +0.152	0.266 +0.181
INDICI CINEMATICI				
1.6 ROM COP AP (mm)	213380	212981	36390 +9.5005	407130 +8.5947
1.7 ROM COP ME (mm)	206336	201836	30760 +12.2715	366790 +6.9904
1.8 ROM SITO AP (mm)	404800	38796	49748 +15.5129	693877 +26.130
1.9 ROM SITO ME (mm)	103465	38409	105611 +3.3811	121088 +7.6405
INDICI CINEMATICI M				
1.10 ROM COP ME (mm)	145088	166805	13898 +5.1347	233097 +30.1015
1.11 ROM SITO ME (mm)	451051	75127	49728 +19.2942	663926 +15.5708
1.12 BASE APPOSIZIONE (mm)	1023524	104491	123892 +23.4608	1510876 +461.178
1.13 INDEX BRACCIO	0.7217	0.687	114 +0.359	0.894 +0.181
ANALISI IN FREQUENZA				
1.14 # FREQ COP AP (°)	0.5125	0.5514	1.075 +0.055	0.662 +0.4036
1.15 # FREQ ANK AP (°)	1.4535	1.1267	0.6345 +0.2389	1.0232 +0.9418
1.16 # FREQ SITO ME (°)	0.4795	0.2066	0.5212 +0.1942	1.397 +0.271
1.17 # FREQ ANK ME (°)	0.0861	0.6336	0.081 +0.6975	0.736 +0.6794
1.18 # FREQ COP (°)	4.5391	0.6262	0.704 +0.625	1.06 +0.029
1.19 # COP COO	0.3665	2.307	0.23 +0.045	2.844 +1.23

Protocollo CoM-Matilde FFP 01.00/2007 -2-

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RESULTS: REPORT EXAMPLE



CON LAP

Pavva OA

Pavva OC

Protocollo CoM-Matilde FFP 01.00/2007 -3-

CON ML

Pavva OA

Pavva OC

Protocollo CoM-Matilde FFP 01.00/2007 -4-

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CONCLUSIONS & FUTURE WORKS



Postural strategies analysis and its evolution



Performance of persons with DS decreases during growth, underlining a delay in milestone development

Development of a clinical report on posture analysis

Importance of frequency analysis

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COLLABORATIONS



⇒ **IRCCS “San Raffaele”, Rome**

- Prof. Giorgio Albertini, MD, Director of the pediatric department of rehabilitative and preventive medicine of developing disabilities
- Nunzio Tenore, rehabilitation therapist

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