Second Course “Motion Analysis and clinics: why to set up a Motion Analysis Lab?”

TRAMA Project

January 14 - 17th 2008

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Bioeng. Dept. Politecnico di Milano, Milano (ITALY)

Main Lab activity

Quantitative analysis of human posture and movement mainly for clinical and rehabilitative applications

The staff of our Lab
The mission

Development of protocol, experimental set-up, software,... for a user-friendly application of movement and gait analysis in clinical field

RESEARCH APPLIED IN CLINICS

THE EQUIPMENT OF OUR LAB

The equipment

KEINECTICS

- ELITE2002 system (BTS, Milan, Italy)
- SMART-D system (BTS, Milan, Italy)
The equipment

- Force platforms → KINETICS
  2 Force platforms (AMTI, USA)

The equipment

- Electromyography → EMG
  TeleEMG (BTS, Milan, Italy)
  PocketEMG (BTS, Milan, Italy)

The equipment

- Video system → VIDEO RECORDING
  VideoController (BTS, Milan, Italy)
LAB ACTIVITIES

Lab activities

Research Clinical service Educational Consulting

Research
- Quantification of pathological functional limitations and quantification of the effects of rehabilitative treatments
- Development of experimental set-up "ad hoc" for different pathologies
- Ergonomic and industrial applications
- Sport biomechanics
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**RESEARCH:**

**CLINICAL APPLICATIONS**

Quantification of pathological functional limitation and quantification of the effects of rehabilitative treatments

- Cerebral Palsy
- Parkinson’s disease
- Down syndrome
- Eating disorders
- Amputees
- …
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Research
Cerebral Palsy

- Quantitative evaluation of functional limitation due to the pathology and its evolution over time;
- Quantitative evaluation of rehabilitative and therapeutic outcomes:
  - Orthopedic surgery
  - Botulinum toxin injection
  - Orthoses and assistive devices
  - Baclofen pump
  - Physiotherapy
- Quantitative identification of the best rehabilitative and therapeutic program

In collaboration with:
- IRCCS “San Raffaele Pisana” and Casa di Cura “San Raffaele Cassino” – Tosinvest Sankt, Kanna
- IRCCS “la Nostra Famiglia” Bosisio Parini (LC)
- Children’s University Hospital Basel (UKKB), Switzerland
- University of Tartu, Tartu, Estonia

Research
Cerebral Palsy


Research
Parkinson’s disease

- Quantitative evaluation of gait and postural strategy related to the pathology;
- Quantitative evaluation of effects of Levodopa treatment on gait and postural control.

In collaboration with:
- Casa di Cura “San Raffaele Cassino” – Tosinvest Sankt, Kanna

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Research Down syndrome

- Evaluation of the effect of orthopedic problems typical of Down syndrome (ligament laxity, hypotonia, flat foot) on gait and postural control;
- Quantitative motor and postural evaluation pre and post rehabilitative programs;
- Relationship between postural and gait indexes and NMR images;
- Development of new protocols for the evaluation of motor and cognitive impairment.

In collaboration with:
+ IRCCS “San Raffaele Rionara” and Casa di Cura “San Raffaele Casnigo” – Trenno (BS), Bergamo, Italy
+ Institute of Basic Research (IBR), Staten Island, NY.

In collaboration with:
+ IRCCS “San Raffaele Pisana” and Casa di Cura “San Raffaele Cassino” – Tornwald (L’A), Roma
+ Institute of Basic Research (IBR), Staten Island, NY.

Research Eating disorders

- Quantitative evaluation of the effect of obesity on postural and gait control;
- Quantitative evaluation of posture and gait strategy in anorexic subjects.

In collaboration with:
+ IRCCS Istituto Auxologico di Piancavallo (VB)

Research Amputees

- Gait analysis in subjects after ACL rupture and with knee prosthesis

In collaboration with:
+ Casa di Curza “La Residenza” Rodello d’Alba (CN)
+ Polisportiva Milanese, Milano

... not only Gait Analysis

Development of experimental set-up "ad hoc" for different pathologies

- Upper limb movements
- Sit-To-Stand
- Energy expenditure during gait
- Posture
- ...

Research

Upper limb movement

Development of protocols for the evaluation of upper limb movements

- Parkinson's disease → quantification of effects of Levodopa treatment
- research for a correlation between quantitative parameters and UPDRS scale

In collaboration with:

- Istituto Neurologico “Carlo Besta”, Milano

Proximal movement

Axial movement

Distal movement

OFF state

ON state
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Research
Upper limb movement

Development of protocols for the evaluation of upper limb movements
- Cerebral Palsy
  Frontal reaching
  Hand to mouth

In collaboration with:
- IRCCS "San Raffaele Pisana" and Casa di Cura "San Raffaele Cassino"
  - Tosliven Santali, Roma
- Istituto Humanitas, Rozzano (MI)

Acquired movement

Lower limbs
Upper limbs
Report

Arm
Forearm

Angle
Angular velocity
Angular acceleration
Moment
Power

Research
Upper limb movement

Development of protocols for the evaluation of upper limb movements during gait
Davies’ protocol (Davies, 1991) + Upper Limb

In collaboration with:
- IRCCS "San Raffaele Pisana" and Casa di Cura "San Raffaele Cassino"
  - Tosliven Santali, Roma
- Children’s University Hospital Basel (UKBB), Switzerland

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Research
Upper limb movement

Sagittal plane

Research
Upper limb movement

Sagittal plane

Frontal plane

Research
Sit-To-Stand

Development of experimental set-up for the evaluation of STS movement
- Adult hemiplegic
- Obese subjects

In collaboration with:
- IRCCS Istituto Auxologico di Piancavallo (VI)
- LAM, Rehabilitation Dept., AUSL Reggio Emilia

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Research Energy expenditure during gait

Development of experimental set-up for the quantification of energy expenditure during gait analysis in CP patients

Experimental set up:
SESS1: Gait Analysis
SESS2: Gait Analysis + K4b2

In collaboration with:
• IRCCS “La Nostra Famiglia” Bosisio Parini (LC)

Research Posture

Development of protocols for the evaluation of posture and movement analysis in pregnant women


Lab activities

Research Clinical service Educational Consulting

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Clinical Service

- Execution of movement analysis tests for hospitals that have not a Motion Analysis Lab.

ISTITUTO "HUMANITAS", Rozzano (MI)
ISTITUTO NEUROLOGICO "C. BESTA", Milano
ISTITUTO NEUROLOGICO "C. MONDINO", Pavia
ISTITUTO TUMORI, Milano

Lab activities

- COURSES

Lab activities

- COURSES

Lab activities

- COURSES
Consulting/Training activity

**TRAMA Project (TRaining in Motion Analysis)**

Programme eLFA (America Latina – Formacion Academica)
→ Network among EU and LA Institutions aim to training in Motion Analysis

ـ Gisimudome Hospital, Rome
ـ Cenacle de la Resurrection, Italy

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Thank you!!!

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Development of new protocols ... not only for clinics

Ergonomic and industrial applications

Sport biomechanics
Thank you!!!