

# STRUMENTAZIONE E BIOTECNOLOGIE PER LE ATTIVITÀ MOTORIE E SPORTIVE ADATTATE

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Ricevimento su richiesta

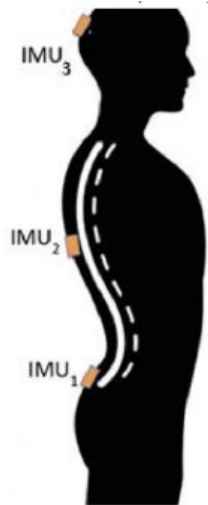
Tel. 0502217475



Esperienza monitoraggio attività motoria

Analisi Posturale Chirurgo

Con Osp. Careggi Firenze, Andrea Cattozzo SMO



Inertial Measurement Unit  
Positioning:

IMU<sub>1</sub>: S1

IMU<sub>2</sub>: T12

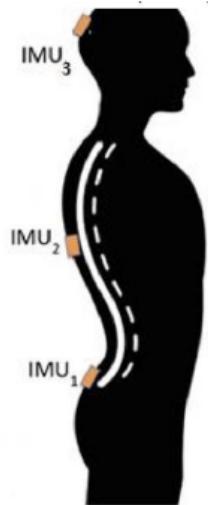
IMU<sub>3</sub>: Testa



# Esperienza monitoraggio attività motoria

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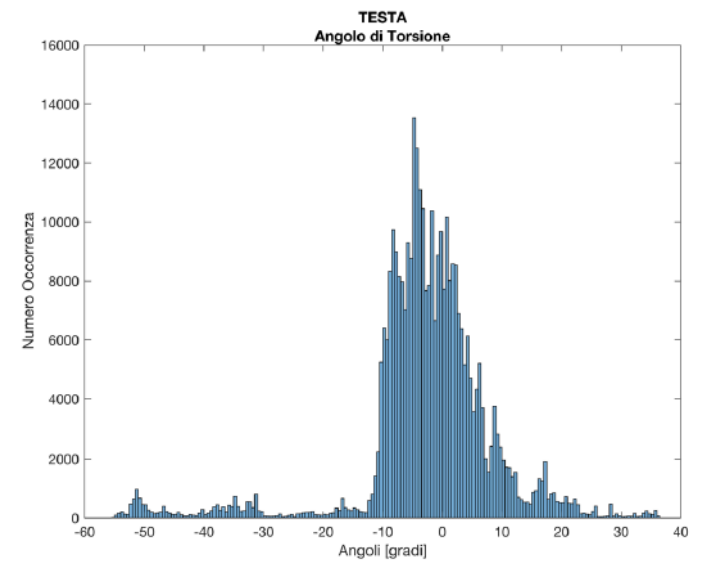
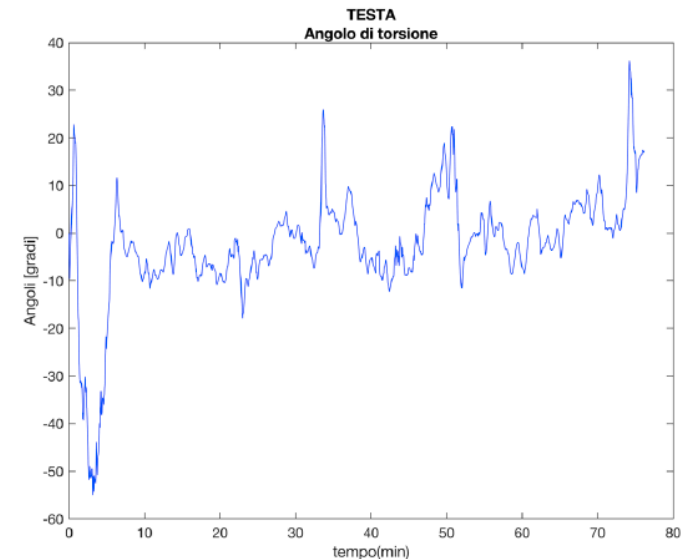


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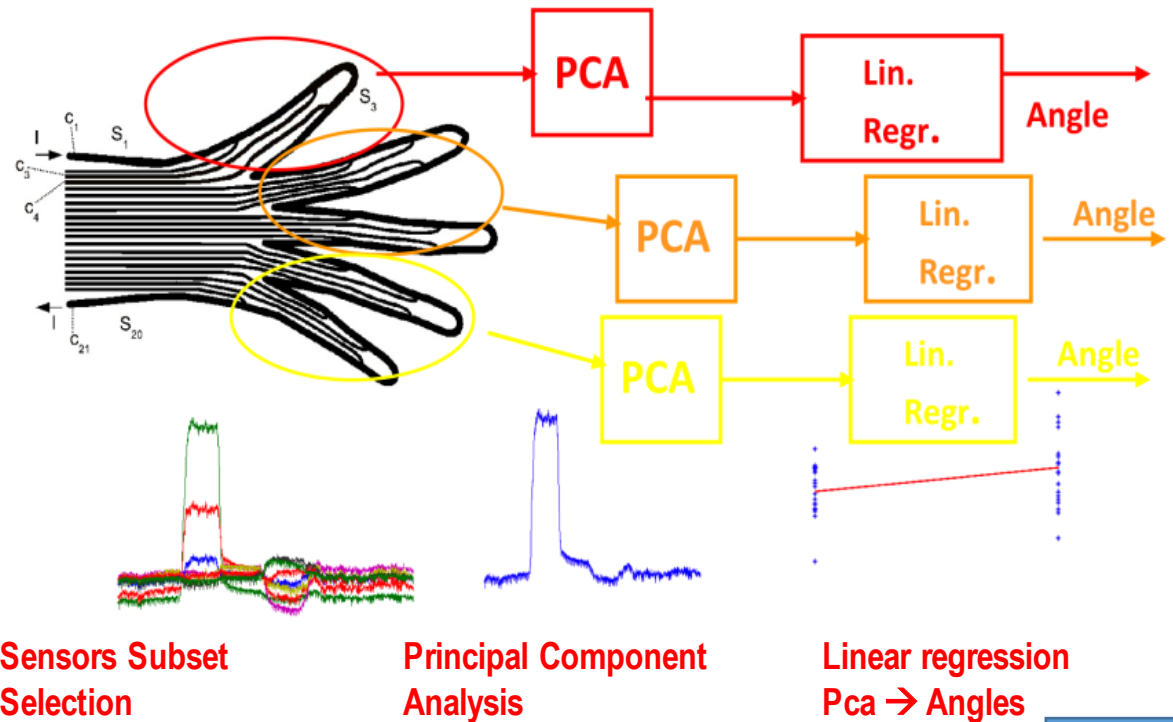
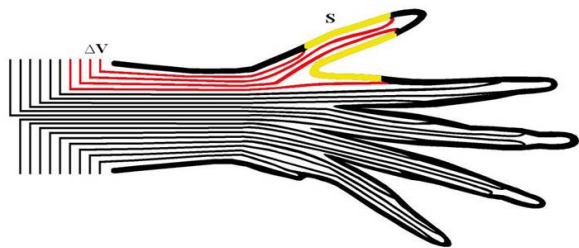
IMU<sub>3</sub>: Testa



# Esperienza monitoraggio attività motoria

## Elaborazione dati per monitoraggio sensori indossabili

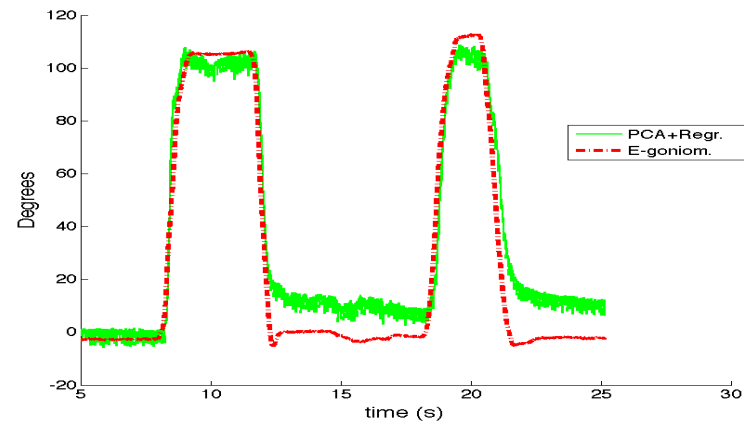
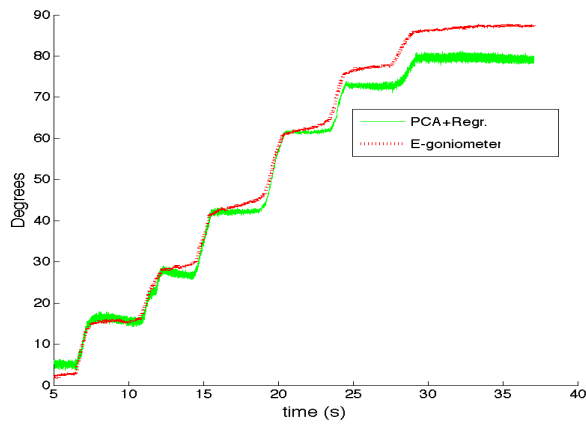
Con Prof. Alessandro Tognetti

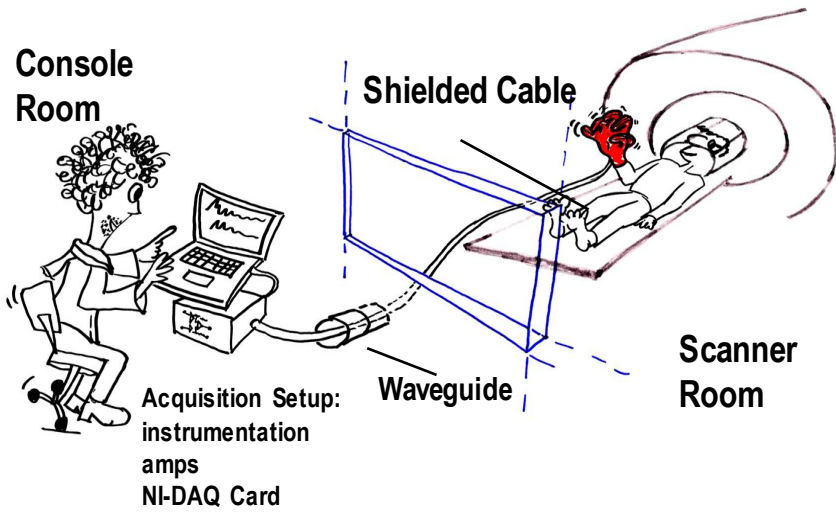


# Esperienza monitoraggio attività motoria

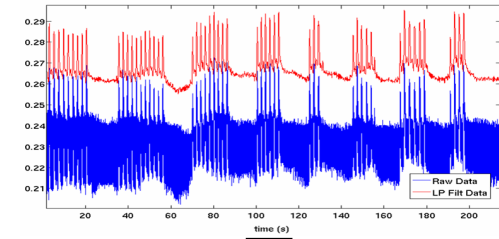
Elaborazione dati per monitoraggio sensori indossabili

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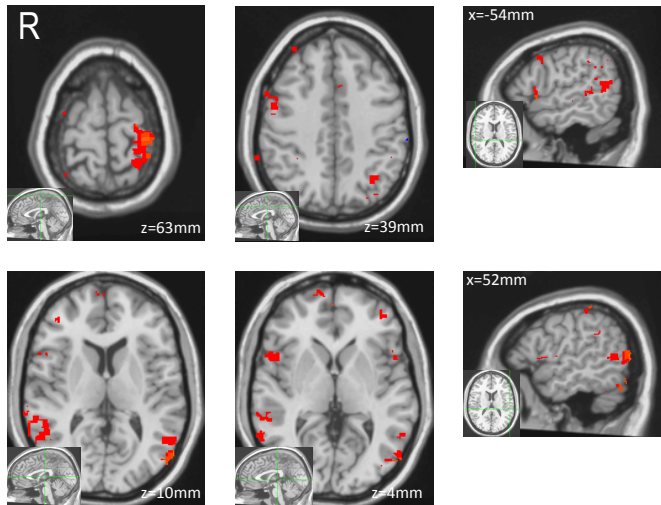
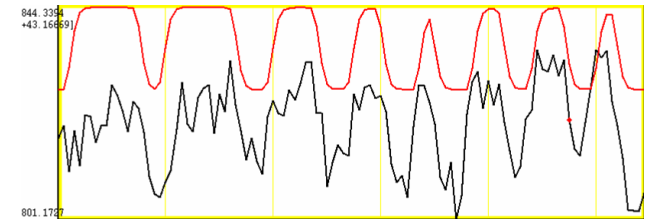


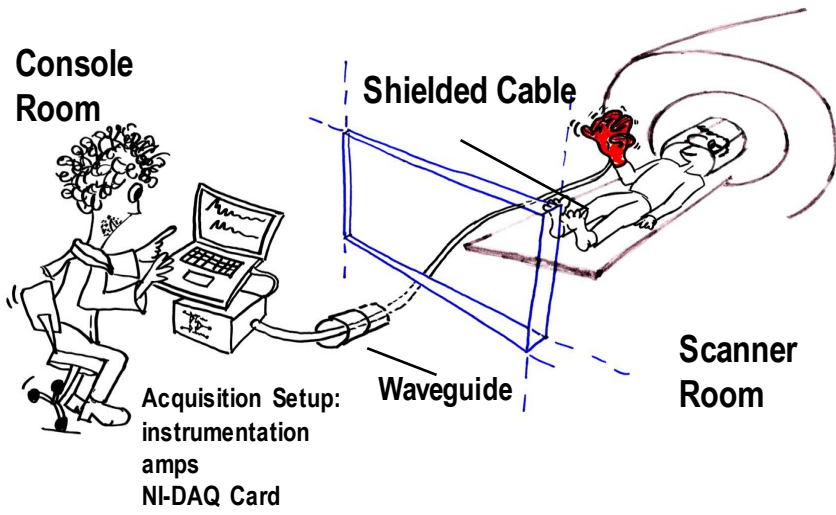


## Sensors Signals

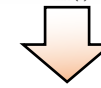
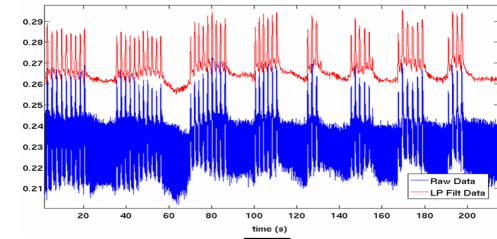


## fMRI Model

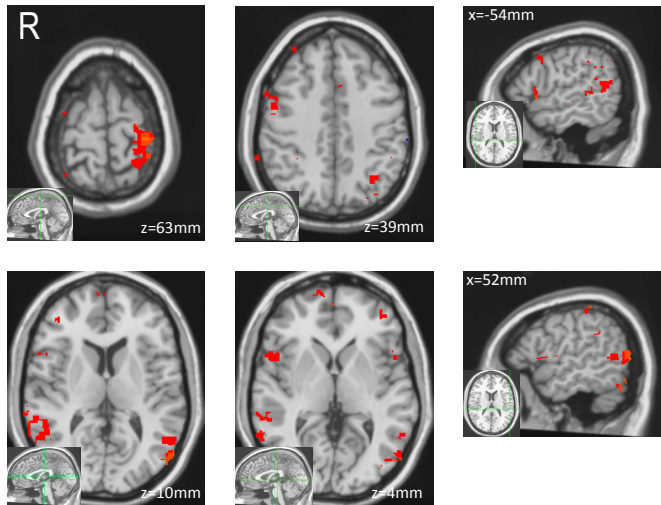
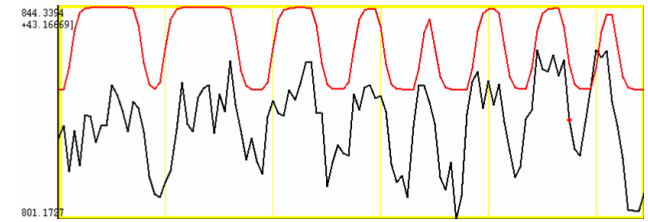




## Sensors Signals



## fMRI Model





## STRUMENTAZIONE E BIOTECNOLOGIE PER LE ATTIVITÀ MOTORIE E SPORTIVE ADATTATE

La tecnologia è differente rispetto a quella usata nell'attività motoria e sportiva classiche ?

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Cosa possiamo fare?

Quanto costa?

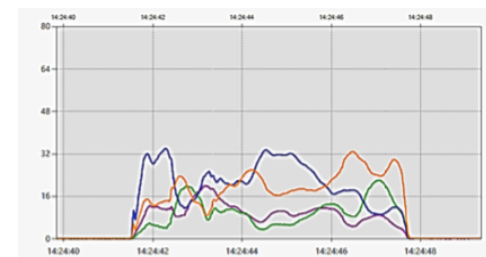
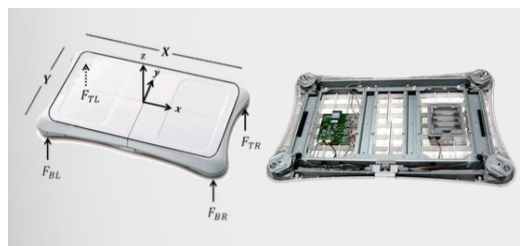
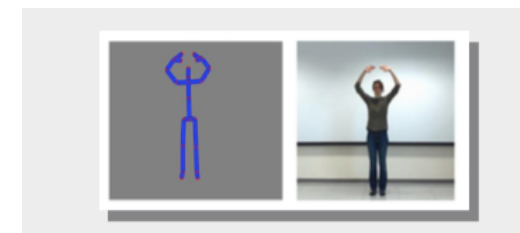
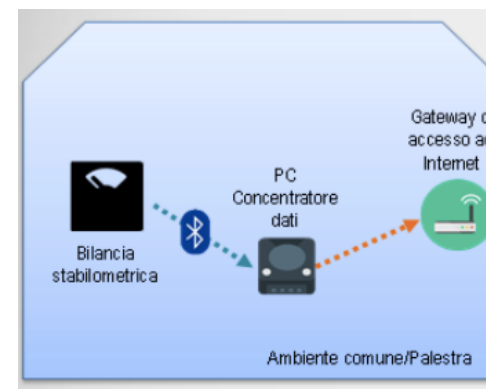
Esempio.



Servizi ICT integrati per il benessere di soggetti fragili

ACCORDO DI PROGRAMMA QUADRO MIUR-ACT-REGIONE TOSCANA

DGRT 758/2013 e s.m.i.  
PAR FAS 2007-2013 - Linea d'azione 1.1  
BANDO FAR-FAS 2014



## Analisi del Cammino



<https://www.youtube.com/watch?v=0UmY1-BG7Bc>

Meglio spendere tanto?

Esempio: analisi del movimento con Vicon e Wii-controller

<http://www.prophysics-sol.se/case-studies/>



NVR  
Nintendo World Report.com

## Misura del ROM (range of motion) - Confronto tra VICON e WII

The experimental protocol involved the evaluation of active ROM of the shoulder in three types of movement:

the maximum shoulder elevation (MSE),  
glenohumeral abduction (GHA)  
internal rotation in abduction (IRA).

In the first two cases, the NWR has been positioned on the humerus , while for the rotation on the forearm

### SHOULDER ROM MEASUREMENT BY USING A GAME CONTROLLER

N. Martini (1), L. Ansaloni (2), F. Galluzzi (1), I. Maci (1), L. Lombardi (1), M. Testa (2), M. Migliorini (1,2)

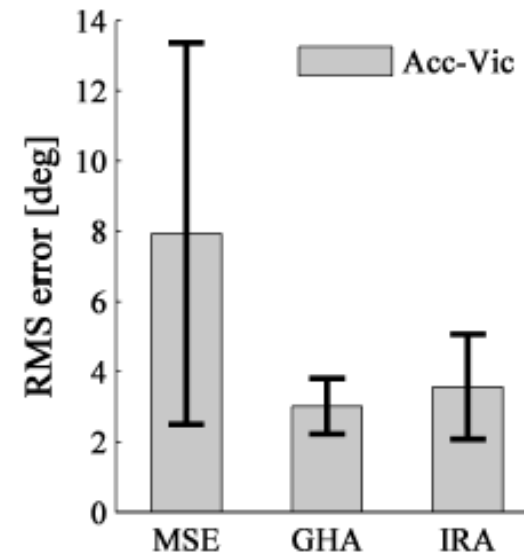
(1) Laboratorio di Bioingegneria – USL2 Lucca, Barga, Italia

(2) Università degli Studi di Genova, Genova, Italia

## Misura del ROM (range of motion) - Confronto tra VICON e WII

|              | MSE [deg]      |                |                | GHA [deg]      |                |                | IRA [deg]     |               |               |
|--------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|
|              | Acc            | AccV           | Vic            | Acc            | AccV           | Vic            | Acc           | AccV          | Vic           |
| <b>Sub 1</b> | 154.2<br>(1.5) | 159.7<br>(2.9) | 151.5<br>(2.7) | 130.4<br>(1.5) | 128.4<br>(1.8) | 128.1<br>(1.7) | 85.8<br>(1.8) | 84.9<br>(1.9) | 83.8<br>(1.9) |
| <b>Sub 2</b> | 133.1<br>(2.5) | 124.8<br>(1.9) | 118.4<br>(1.6) | 97.9<br>(1.8)  | 97.0<br>(1.7)  | 95.7<br>(1.8)  | 94.0<br>(2.3) | 93.6<br>(2.3) | 90.8<br>(2.1) |
| <b>Sub 3</b> | 152.5<br>(1.4) | 145.3<br>(0.9) | 139.8<br>(1.3) | 104.1<br>(1.7) | 102.5<br>(1.2) | 101.2<br>(1.5) | 82.4<br>(1.5) | 81.5<br>(1.1) | 76.8<br>(0.9) |
| <b>Sub 4</b> | 162.1<br>(0.8) | 166.6<br>(0.8) | 158.4<br>(0.9) | 102.7<br>(4.4) | 100.8<br>(5.5) | 98.6<br>(3.5)  | 78.6<br>(3.1) | 78.6<br>(2.5) | 74.0<br>(3.0) |
| <b>Sub 5</b> | 150.2<br>(2.5) | 161.7<br>(2.0) | 153.5<br>(1.5) | 110.5<br>(3.0) | 107.0<br>(2.9) | 107.2<br>(2.7) | 72.8<br>(2.0) | 74.3<br>(2.5) | 70.5<br>(1.8) |

**Table 1.** Summary statistics of shoulder ROM measurements.

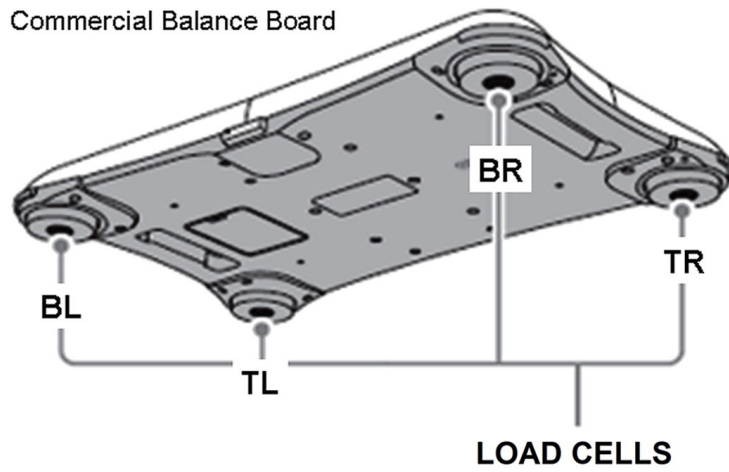


**Figure 1.** Inclination error.

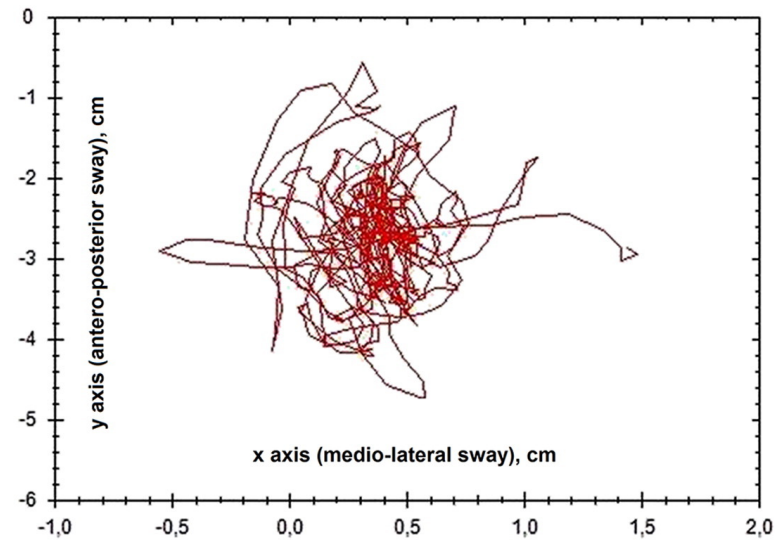
The NWR inclinometer exhibits high accuracy as compared to the results obtained by the Vicon system, especially in GHA and IRA movements where the resulting error has been below 4 degrees. The MSE measurements show a higher systematic error. However, the low variability found in all the measurements demonstrates the high reproducibility of the instrument.

**A**

Commercial Balance Board



**B**





# Validity and reliability of the Nintendo Wii Balance Board for assessment of standing balance

Ross A. Clark<sup>a,\*</sup>, Adam L. Bryant<sup>a</sup>, Yonghao Pua<sup>b</sup>, Paul McCrory<sup>a</sup>, Kim Bennell<sup>a</sup>, Michael Hunt<sup>a</sup>

<sup>a</sup>Centre for Health, Exercise and Sports Medicine, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Carlton, Victoria 3010, Australia

<sup>b</sup>Department of Physiotherapy, Singapore General Hospital, Singapore



|                                 | FP                | WBB               | Mean diff (95%CI)   | ICC (95%CI)       |
|---------------------------------|-------------------|-------------------|---------------------|-------------------|
| <b>Single limb, eyes open</b>   |                   |                   |                     |                   |
| Day 1                           | 42.2 (10.6)       | 48.3 (13.7)       | -6.1 (-9.2, -3.0)   | 0.81 (0.39, 0.92) |
| Day 2                           | 40.3 (8.8)        | 47.6 (12.9)       | -7.2 (-9.9, -4.6)   | 0.80 (0.02, 0.93) |
| Mean Diff (95% CI)              | 1.9 (-.48, 4.2)   | 0.7 (-2.8, 4.3)   |                     |                   |
| ICC (95%CI)                     | 0.89 (0.76, 0.95) | 0.86 (0.70, 0.93) |                     |                   |
| SEM                             | 3.5               | 5.1               |                     |                   |
| MDC (%)                         | 23.0              | 29.4              |                     |                   |
| <b>Single limb, eyes closed</b> |                   |                   |                     |                   |
| Day 1                           | 80.2 (21.9)       | 87.0 (20.4)       | -6.6 (-11.5, -1.8)  | 0.88 (0.69, 0.95) |
| Day 2                           | 75.8 (18.5)       | 90.9 (26.1)       | -15.2 (-21.3, -9.0) | 0.77 (0.03, 0.92) |
| Mean Diff (95% CI)              | 4.4 (-2.2, 11.0)  | -4.0 (-11.2, 3.3) |                     |                   |
| ICC (95%CI)                     | 0.79 (0.54, 0.90) | 0.81 (0.59, 0.91) |                     |                   |
| SEM                             | 10.0              | 11.4              |                     |                   |
| MDC (%)                         | 34.7              | 28.3              |                     |                   |



<https://www.amti.biz>

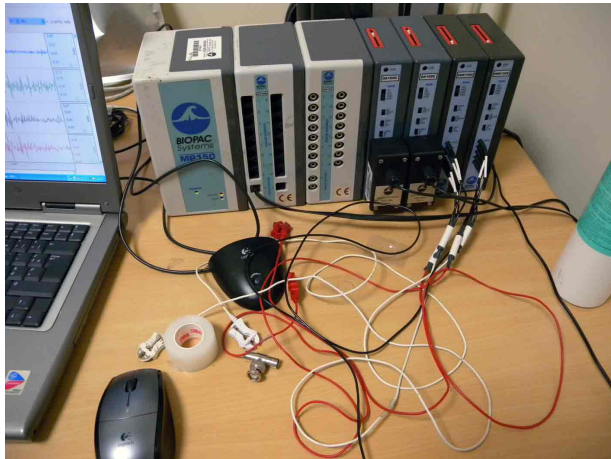
## Obiettivi del Corso

Descrivere le tecnologie

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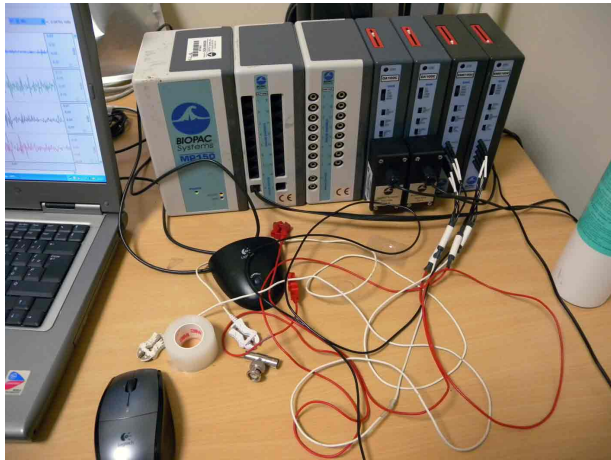
Quelle da Laboratorio o ad alte prestazioni



## Obiettivi del Corso

Descrivere le tecnologie

Quelle da Laboratorio o ad alte prestazioni



ma forse anche



## Obiettivi del Corso

Descrivere le tecnologie, anche quelle a basso costo

Discuterne i limiti e possibilità: dai principi fisici alla informazione utile

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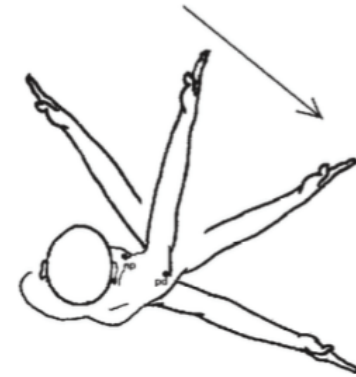
Discutere possibilità di analisi del dato

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Discuterne i limiti e possibilità: dai principi fisici alla informazione utile

Discutere possibilità di analisi del dato.



Cross-correlation time-frequency analysis for multiple EMG signals  
in Parkinson's disease: a wavelet approach

Gennaro De Michele <sup>a</sup>, Stefano Sello <sup>a,\*</sup>, Maria Chiara Carboncini <sup>b</sup>, Bruno Rossi <sup>b</sup>,  
Soo-Kyung Strambi <sup>b</sup>

