

The treatment of the orthopedic patient by the use of a mobile platform

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Introduction

- ✍ The postural control is the result of the interactions among systems
- ✍ The dosage of the muscular strain is fundamental to perform the postural control
- ✍ The necessary proprioceptivity for the human living comes from capsular, ligament, tendon and muscular receptors.

Introduction

- ✍ The pharmacological block of the articular receptor of the ankle, does not influence mostly (Komadsen 1993):
 - a) the joint position system (JPS) of the ankle
 - b) the reaction time of the muscles after an unexpected reaction

Introduction

- ✍ The main circuit for the reaction of the balance , would start from the neuromuscular zones (Diener et al , 1985)
- ✍ The flexor along the fingers is a very important indicator of the movement of the ankle (Sheth et al, 1997)

....an even more important
role of the myotendineous
features to maintain the
posture and the articular
stability

Introduction:

Use of the unstable plate to reeducate the ankle

- ✍ Tropp et al (1985): a 10 weeks rehabilitation programme of the ankle by using the unstable plate, reduces the risk of ankle sprains in the soccer players.
- ✍ Sheth et al (1997): a 8 weeks programme with the unstable plate, causes a delayed recruit of the inversor tibial muscles.

Introduction:

Perception of the load:

- ✍ The ankle is stable when it is in a neutral position towards the load
- ✍ The ankle is unstable when loaded during the gait

(Stormont, 1985)

... The perception of the load
is important

Goals:

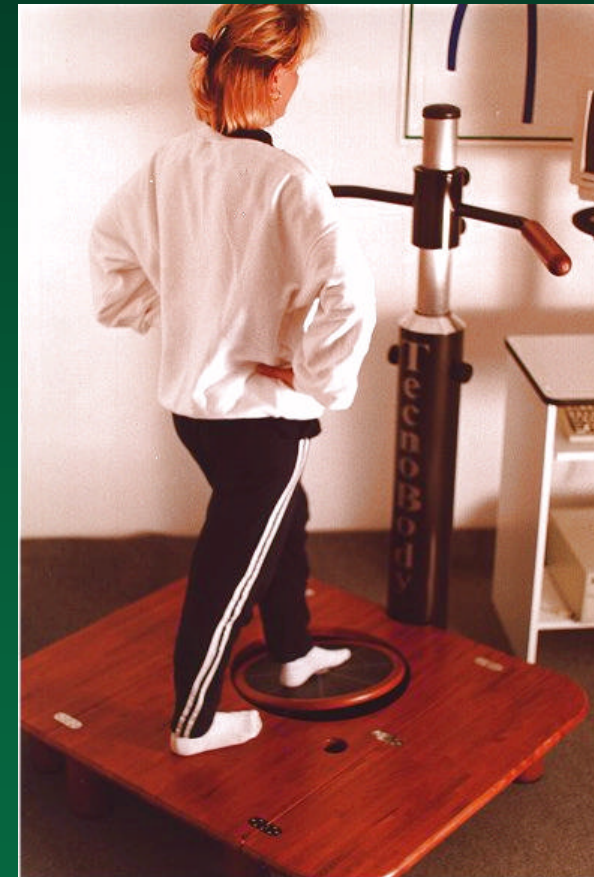
- ✍ To process a test to measure:
 - the skill to control the position of the ankle , on the frontal and sagittal planes
 - the skill to control the ankle load

Materials and methods

- ✍ A mobile computerized platforms which performs:
 - the real time measure of the position of the ankle in the frontal and sagittal planes
 - the real time measure of the applied force
 - an acoustic and visual feedback

Materials and methods

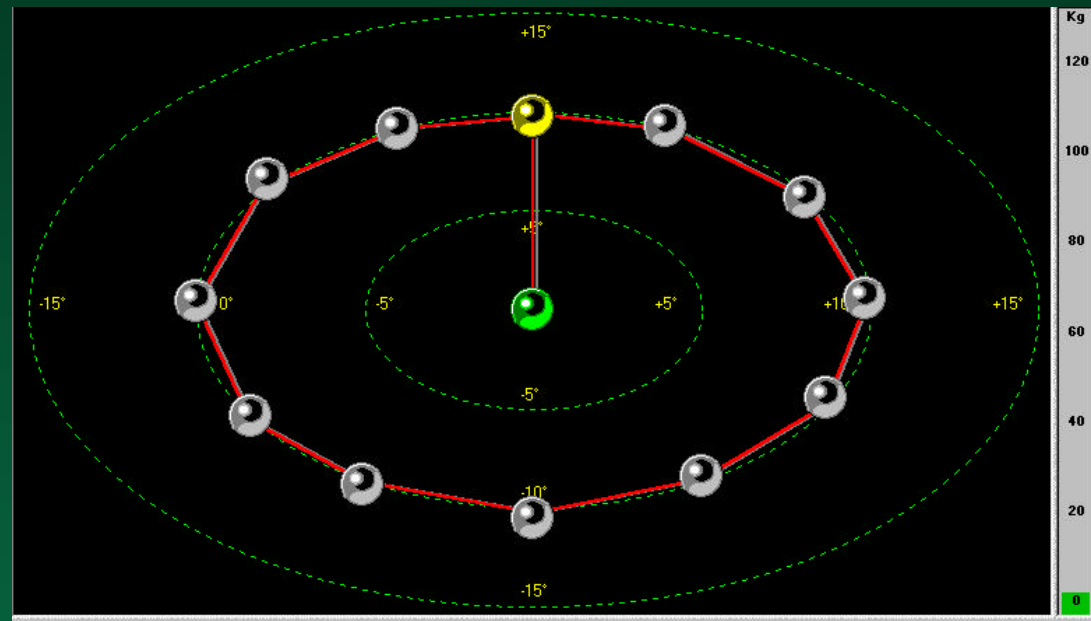
- ✍ Sagittal view of a splayed patient , with the dominant foot on the platform, and the hands on the hips.



Materials and methods

- ✍ 1° test: the patient has to perform a path defined by 12 targets , the most precisely possible , by the movement of the ankle
- ✍ to repeat the same test four times, with different applied force (20-40-60 % of the weight of the body)

Materials and methods



- ✍ Parameter calculated:
- performed path/minimum path X 100

Materials and methods

- ✍ 2° test: maintaining the position and a constant force with open eyes (with acoustic and visual feedback) and with closed eyes (only acoustic feedback).
- ✍ 4 repetitions at different applied forces (20-40-60% of the body weight)
- ✍ observed parameter : variance of the applied force.

Materials and methods

- ✍ 13 healthy patients:
- ✍ 7 male patients , average age of 31,5 (range 23-42)
- ✍ 6 female patients , average age of 28,1 (range 23-40)

Results :

- ✍ 1° test: performed path/minimum path x 100:
 - male (average +/- DS): 119,57 % +/- 2,8
 - female (average +/- DS): 126,33 % +/- 4,1
- ✍ no main difference among the tests made with different applied force

Results

- ✍ 2° test :variance of the applied force of 20% of the body weight with open eyes
- ✍ male (average +/- DS): 0,68 +/- 0,59
- ✍ female (average +/- DS): 0,32 +/- 0,18

Results

✍ 2° test: variance of the applied force of 40 % of the body weight , with open eyes

✍ male: 0,55 +/- 0,51

✍ female: 0,67 +/- 0,2

Results

✍ 2° test: variance of the applied force of 60 % of the body weight at open eyes

✍ male: 0,62 +/- 0,55

✍ female : 0,68 +/- 0,51

Results

✍ 2° test: variance of the applied force of 20 % of the body weight with closed eyes

✍ male : 0,91 +/- 0,52

✍ female: 1,49 +/- 0,61

Results

✍ 2° test: variance of the applied force of 40 % of the body weight with closed eyes

✍ male: 0,96 +/- 0,47

✍ female: 1,86 +/- 0,88

Results

✍ 2° test: variance of the applied force of 60 % of the weight body with closed eyes

✍ male: 1,24 +/- 0,61

✍ female: 2,77 +/- 2,55

Remarks

1°test:

- the female patient seem less able to control the ankle movement and the applied load (Leandersen , 1996 :”Higher postural staggering in the female patients “)
- a percentage of the body weight that makes the movement control more difficult , doesn't seem to exist.

Remarks

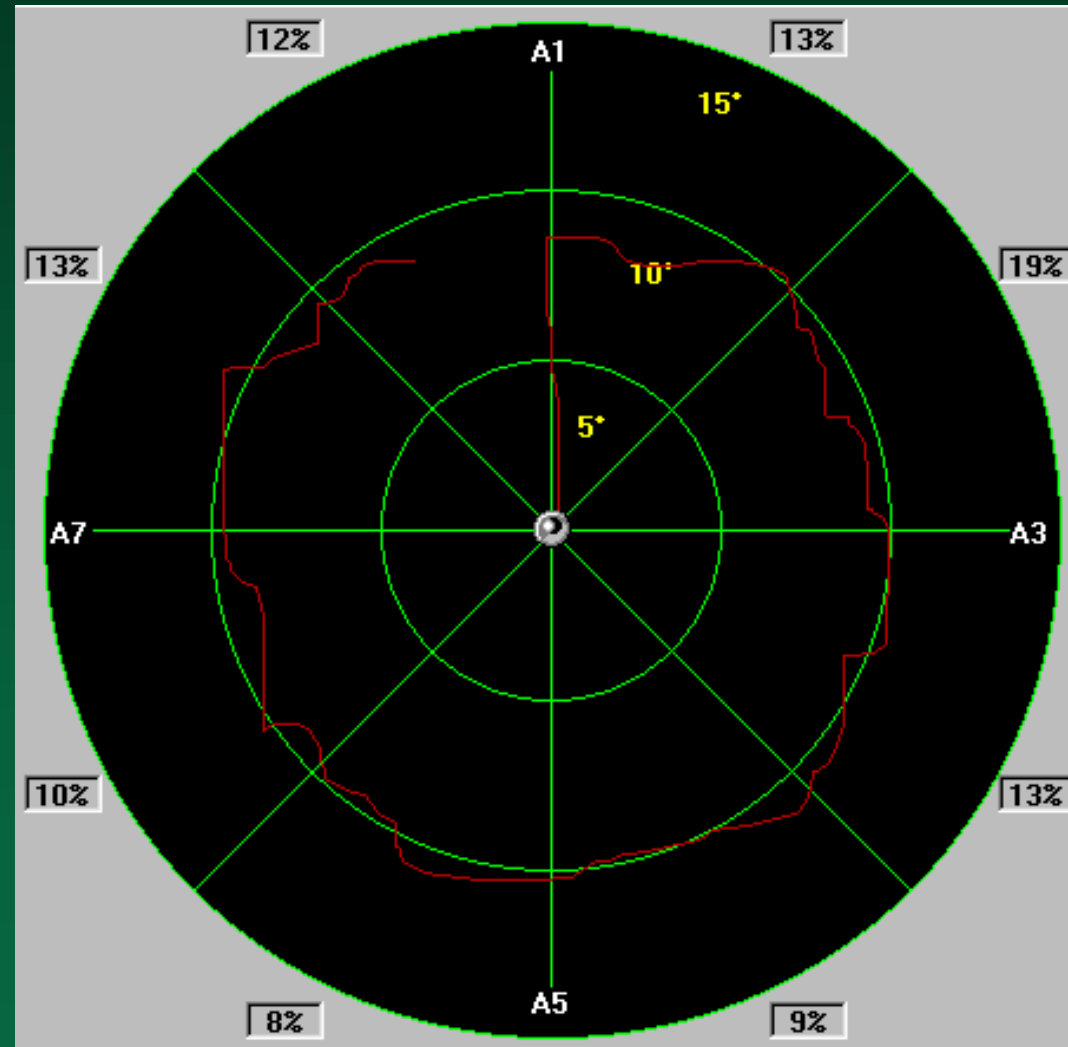
2° test:

- the visual feedback seems to play an important role to control the applied force.
- Main differences among the tests performed at 20, 40 and 60 % of the body weight, are not verified.

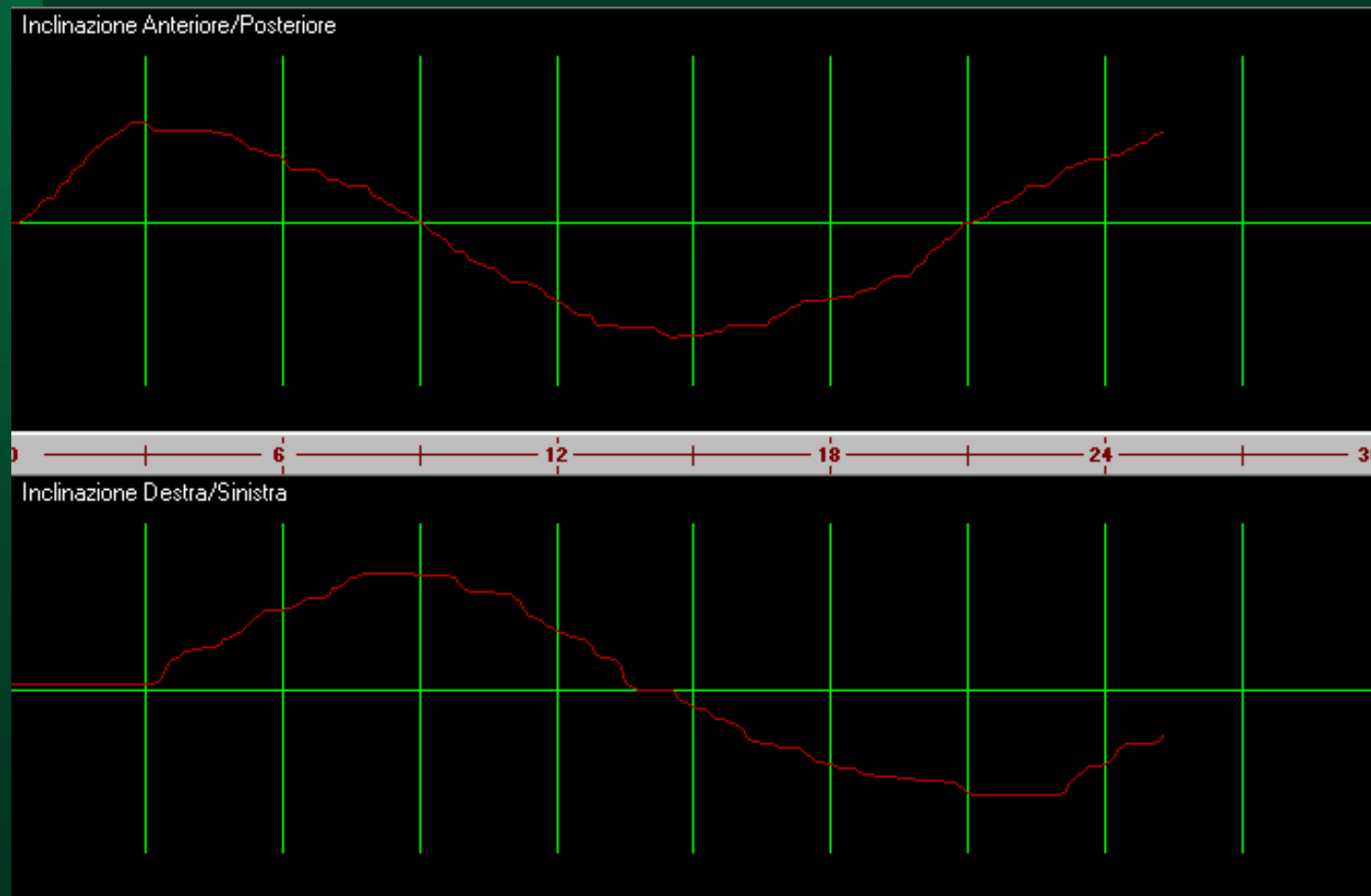
Future developments

- ✍ To measure the ability of the movement control and the applied force , displayed into 4 quadrants:
 - plantar flexion and eversion
 - dorsal flexion and eversion
 - dorsal flexion and inversion
 - plantar flexion and inversion

Analysis of the movement in the 4 quadrants



Analysis of the circular movement , in two graphs.



✍ male pathologic patient :

1° test: 135,33 +- 7,7 (vs 119,57 +/- 2,8)

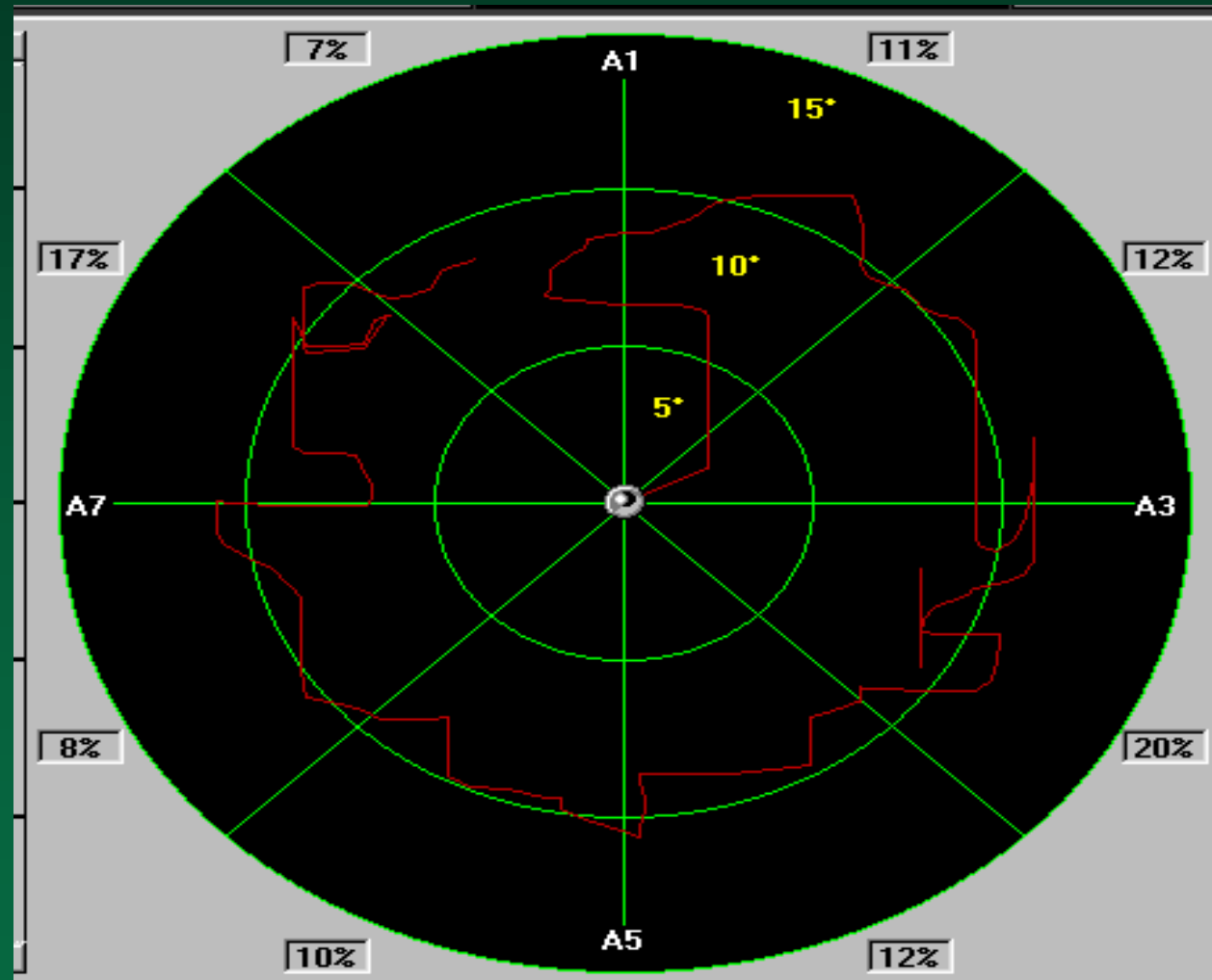
2° test open eyes:

- at 20 %: 1,75 (vs 0,68 +- 0,59)
- at 40 %: 1,07 (vs 0,55 +- 0,51)
- at 60 %: 0,75 (vs 0,62 +- 0,55)

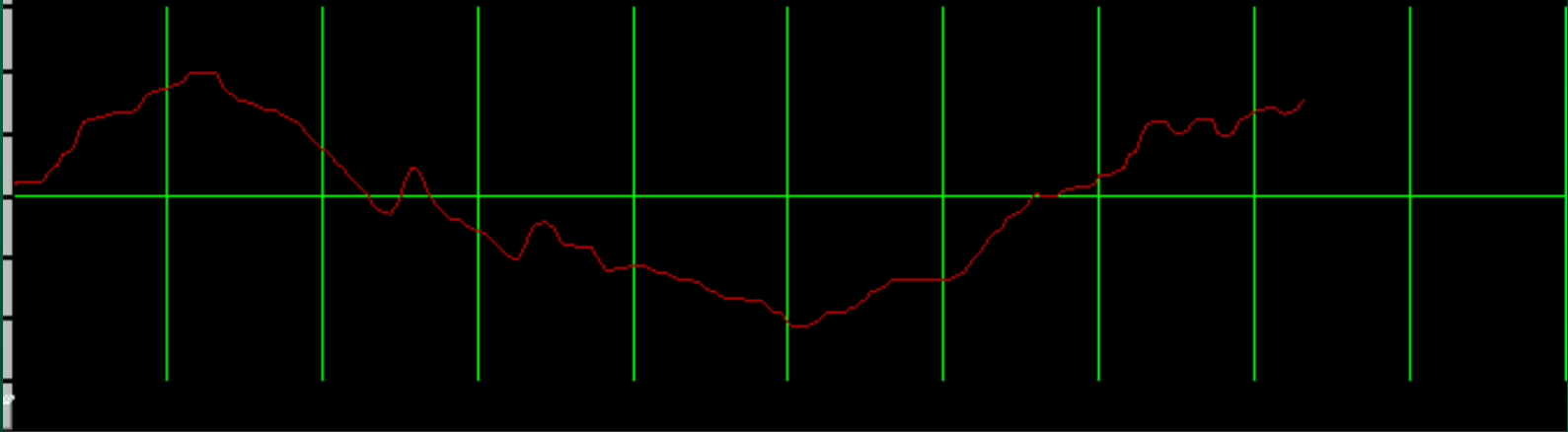
✍ Male pathologic patient:

- 2° test closed eyes:
- at 20 %: 3,37 (vs 0,91+- 0,52)
- at 40 %: 5,30 (vs 0,96 +- 0,47)
- at 60 %: 2,57 (vs 1,24 +- 0,61)

Highlight of problems in the proprioceptive control

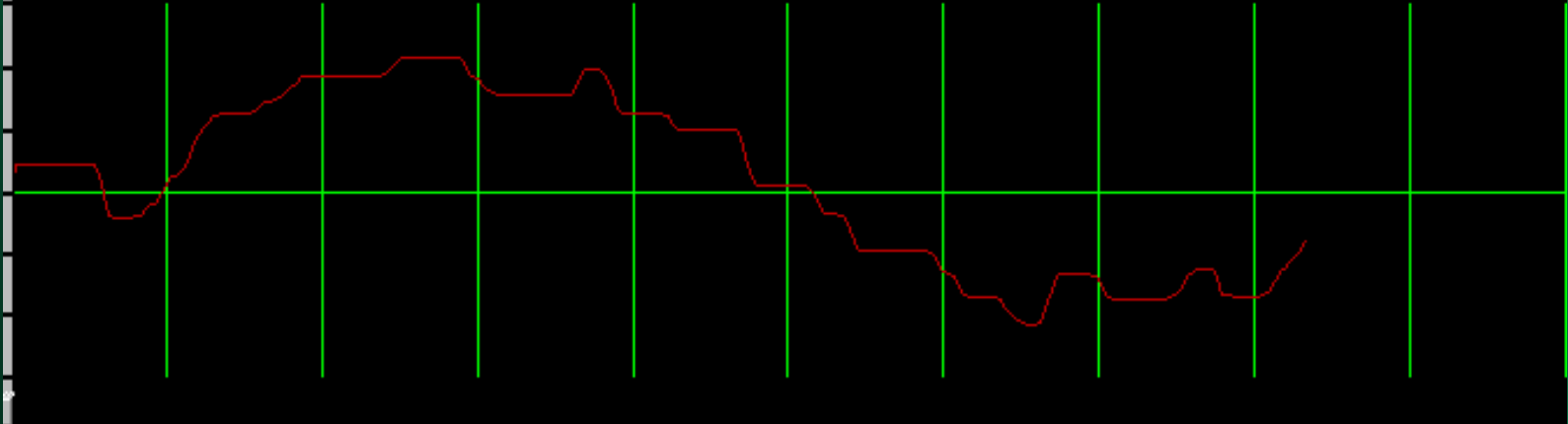


Inclinazione Anteriore/Posteriore



0 6 12 18 24 30

Inclinazione Destra/Sinistra



Future developments

- ✍ To have a large number of healthy patient to define the range of normality .
- ✍ to make patients , with chronic instability of the ankle, to perform the test

Future developments

- ✍ To verify the results of one rehabilitation programme , performed with **a computerized mobile platform** (with acoustic and visual feedback) vs **the unstable table**
- ✍ follow up patients to verify the risk of relapse of distortions.

Thank you !!!!!!!