

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 inverter 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

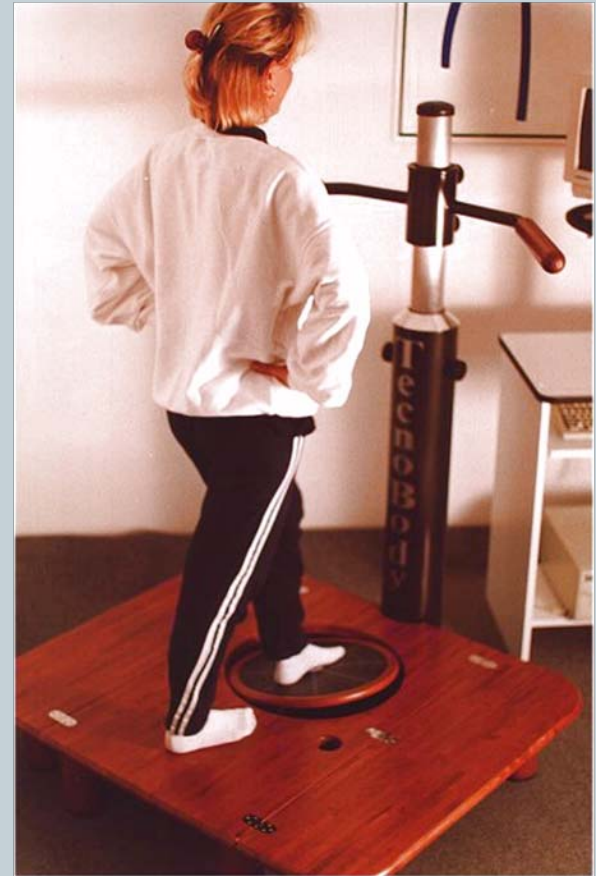


- **A mobile computerized platforms which performs:**
 - the real time measure of the position of the ankle in the frontal and sagittal planes
 - the real time measure of the applied force
 - an acoustic and visual feedback

Materials and methods



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

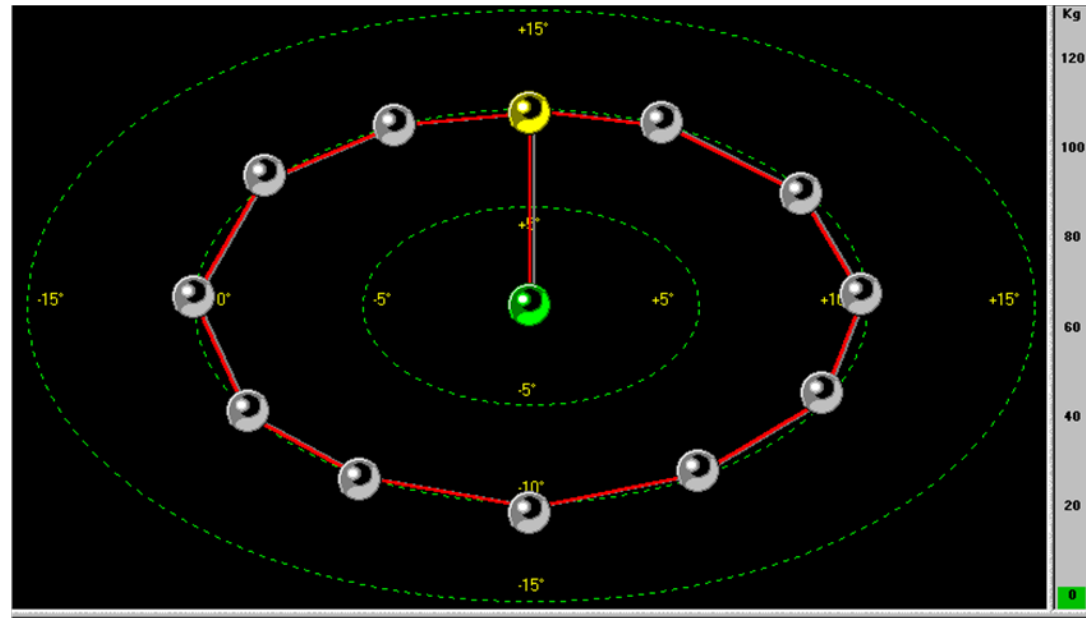


Materials and methods



- 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



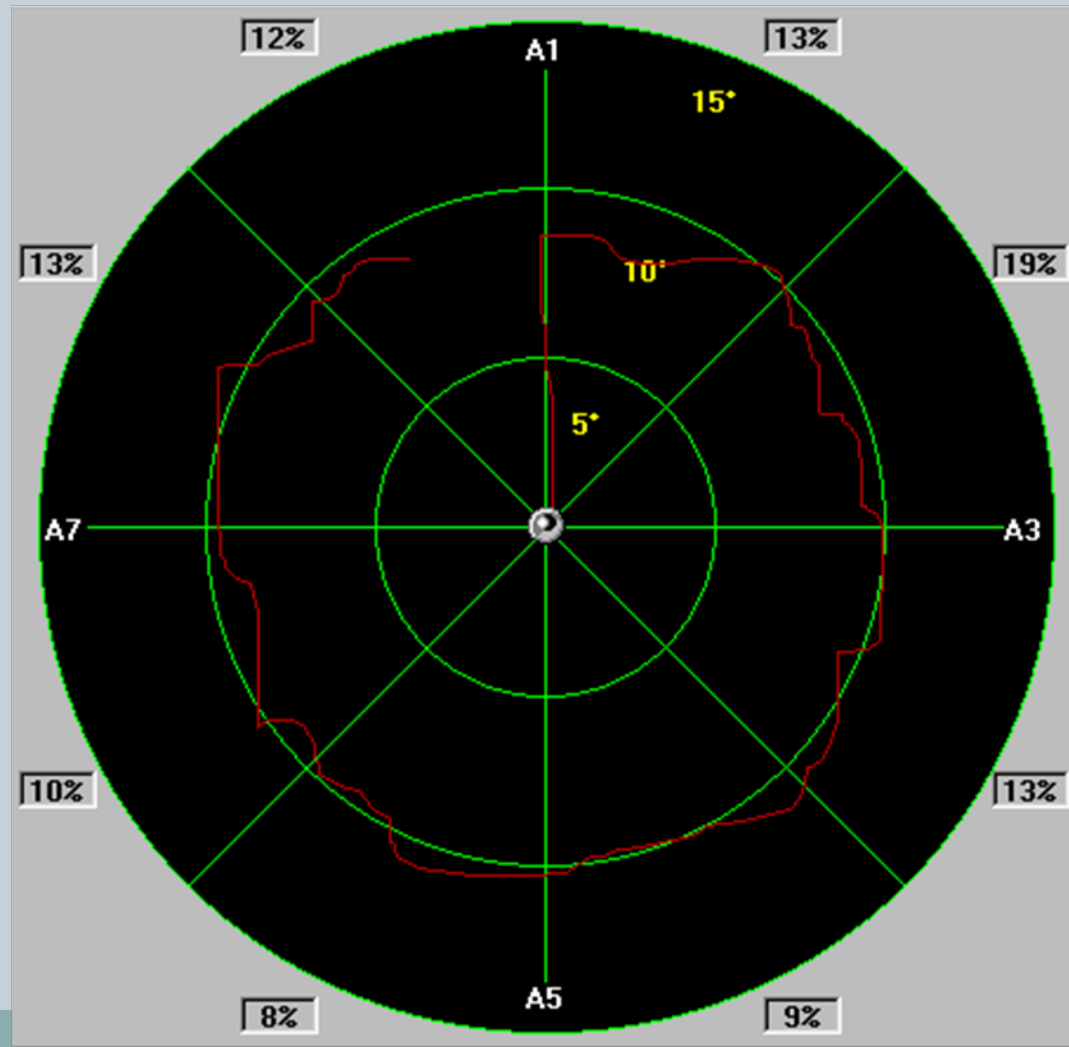
- **2° test:**
 - the visual feedback seems to play an important role to control the applied force.
 - Main differences among the tests performed at 20, 40 and 60 % of the body weight, are not verified.

Future developments

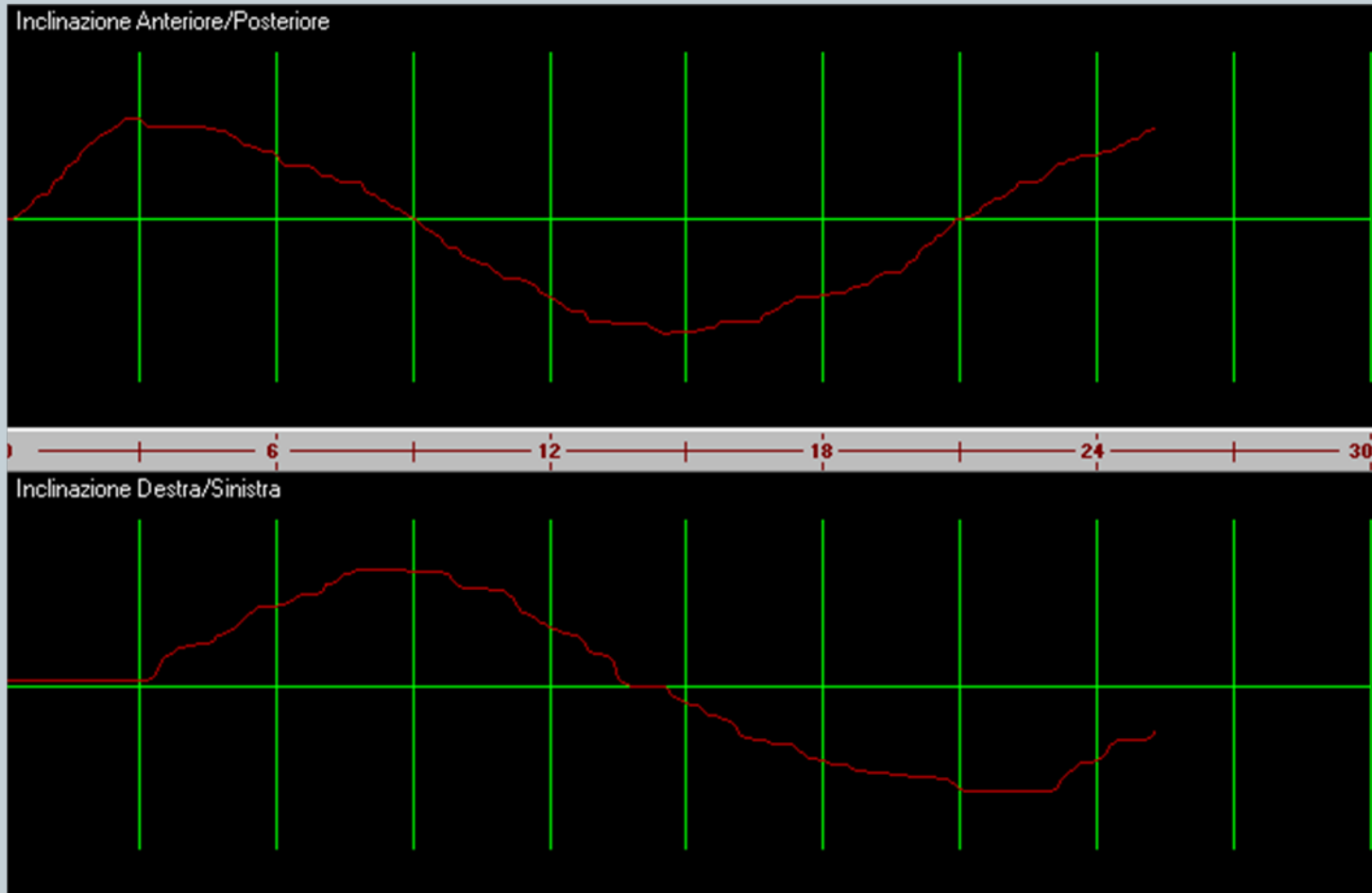


- To measure the ability of the movement control and the applied force , displayed into 4 quadrants:
 - plantar flexion and eversion
 - dorsal flexion and eversion
 - dorsal flexion and inversion
 - plantar flexion and inversion

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)

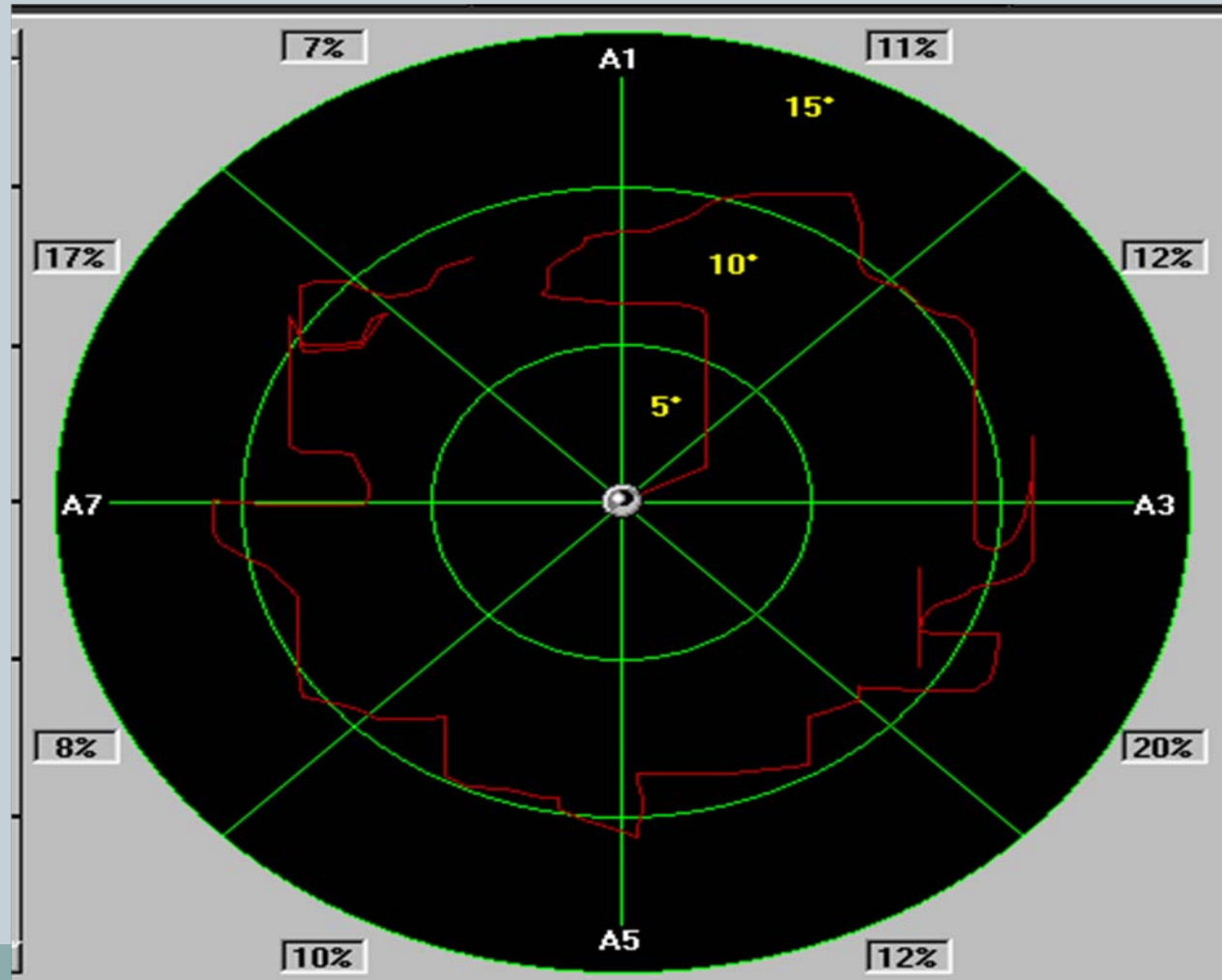
2° test open eyes:

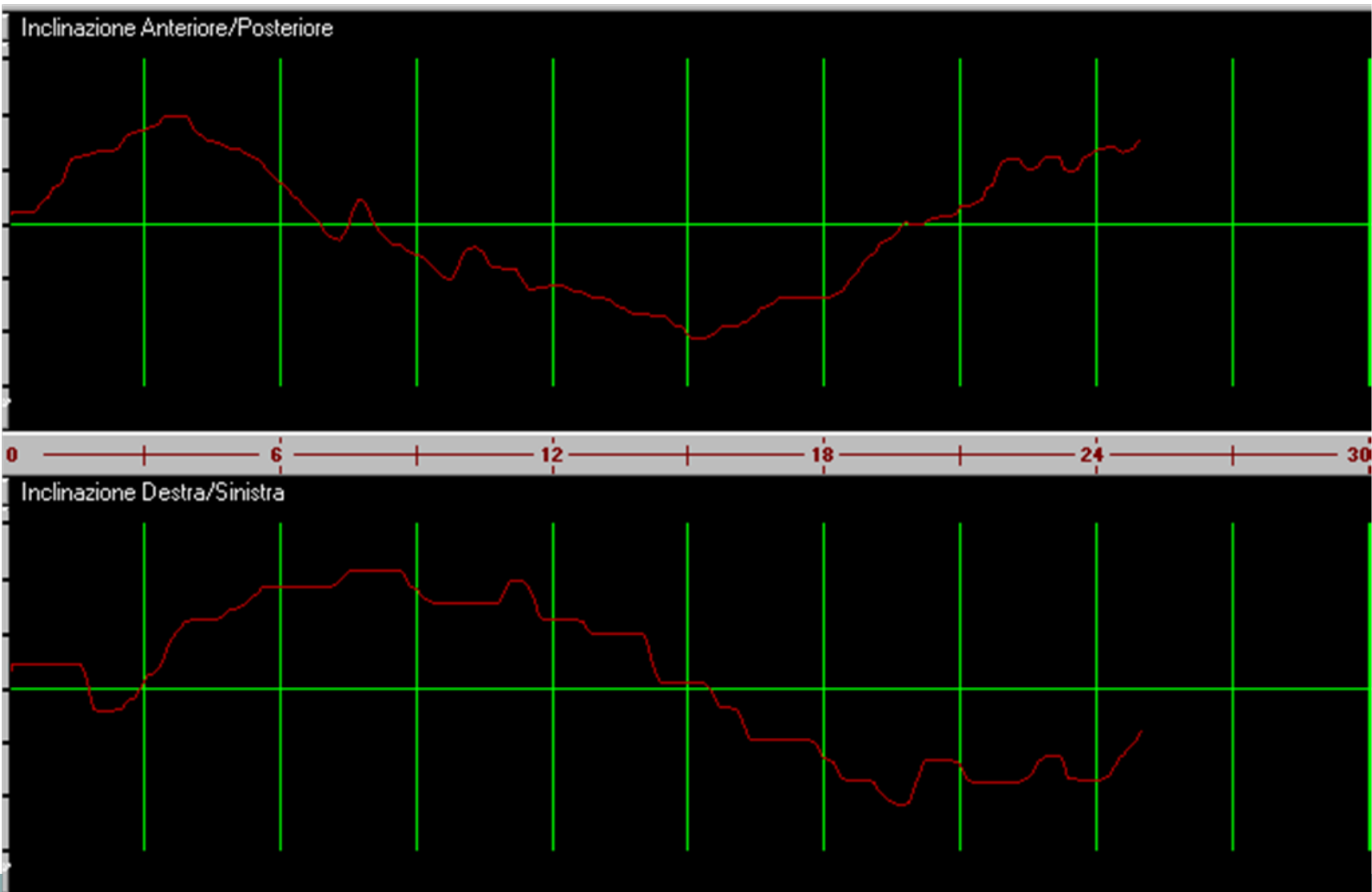
- at 20 %: 1,75 (vs 0,68 +- 0,59)
- at 40 %: 1,07 (vs 0,55 +- 0,51)
- at 60 %: 0,75 (vs 0,62 +- 0,55)



- **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





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 !!!!!!!