



Associazione AEQUABILITAS
Scienze e Cultura del movimento

07 NOVEMBRE 2015
Sala polivalente – Fondazione Mons. Comi,
Via Forlanini 1, Luino (VA)
LO SPORT: PERFORMANCE E SALUTE

ToB Test of Balance

dr Alessandro Manelli, Fisiatra

U.O. Fisiatria ASL1 Imperiese
Direttore dr E. Trucco



Sistema posturale e controllo dell'equilibrio

Come riesce un uomo a mantenere una postura eretta o inclinata contro il vento che soffia contro di lui?

Egli possiede un senso attraverso il quale conosce l'inclinazione del proprio corpo e che possiede l'attitudine ad aggiustarla e correggere ogni scarto in rapporto alla verticale...

Charles Bell 1837

Integrazione di più sistemi:

Esoentrate

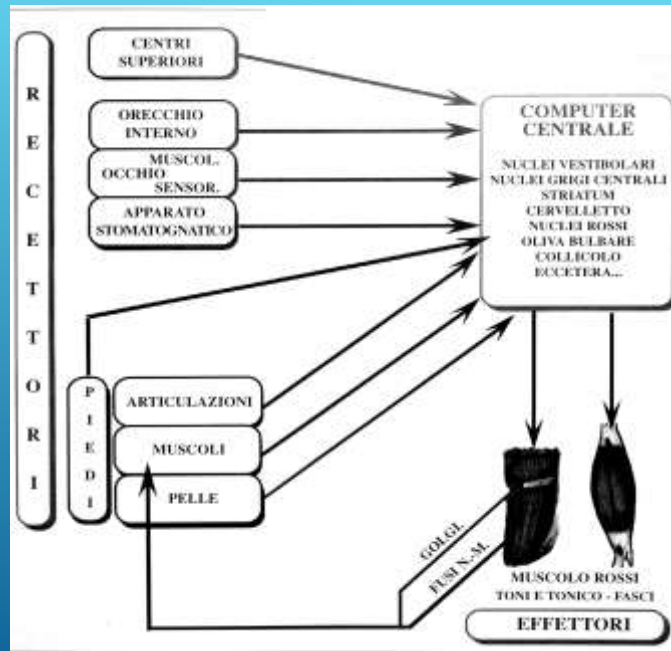
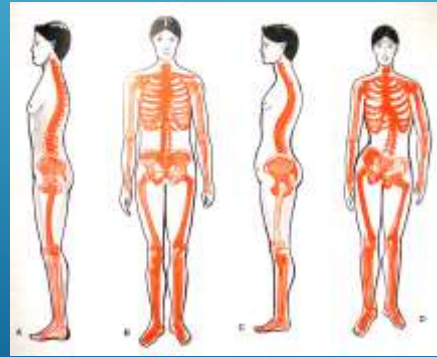
Occhio
Vestibolo
Sensibilità tattile

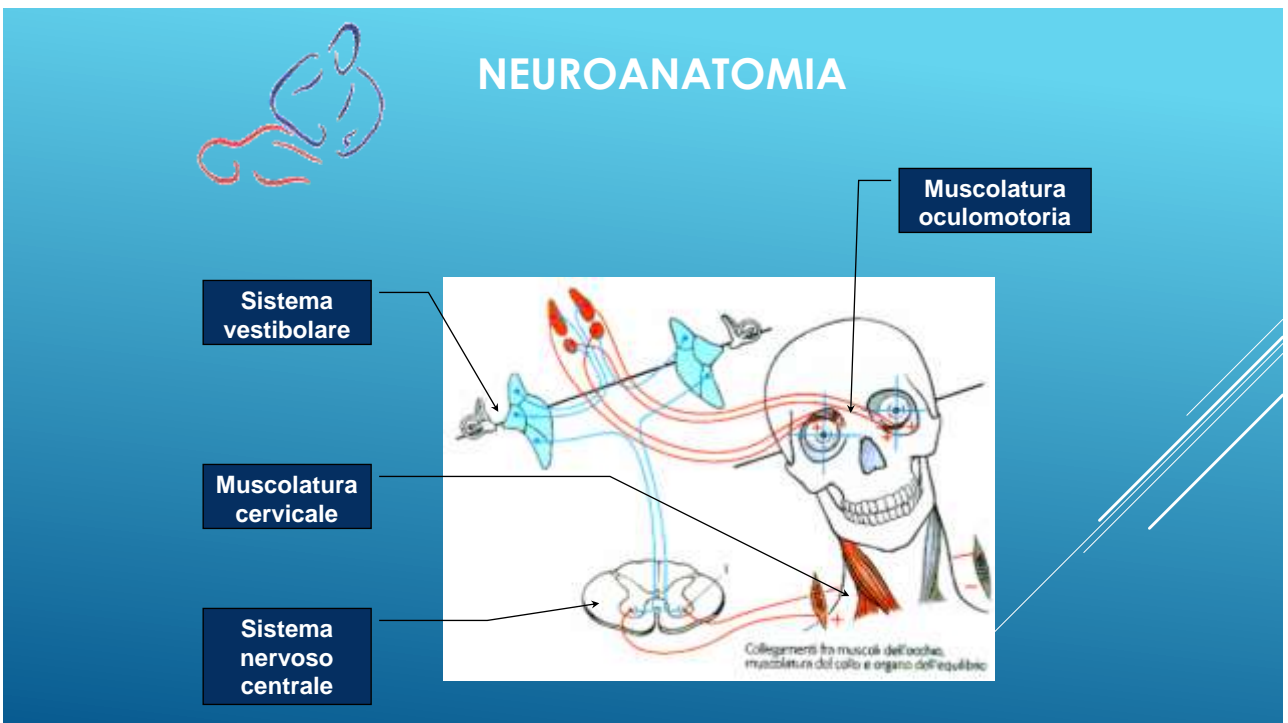
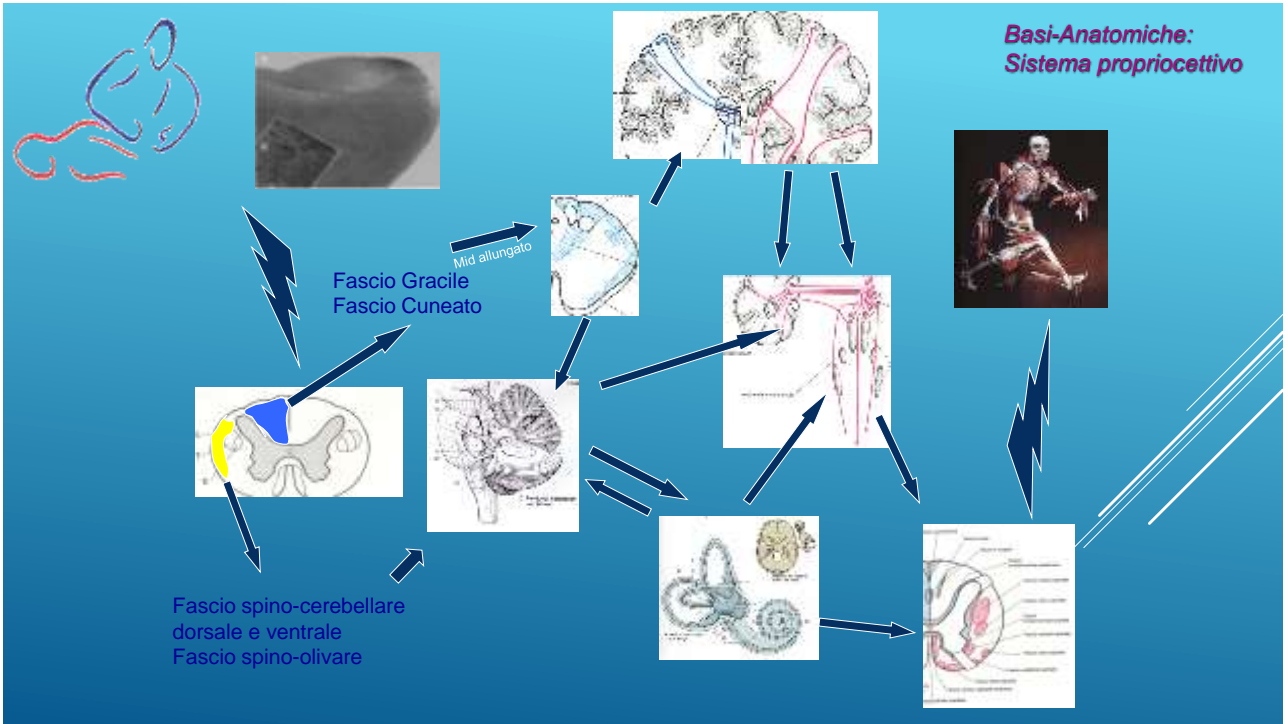


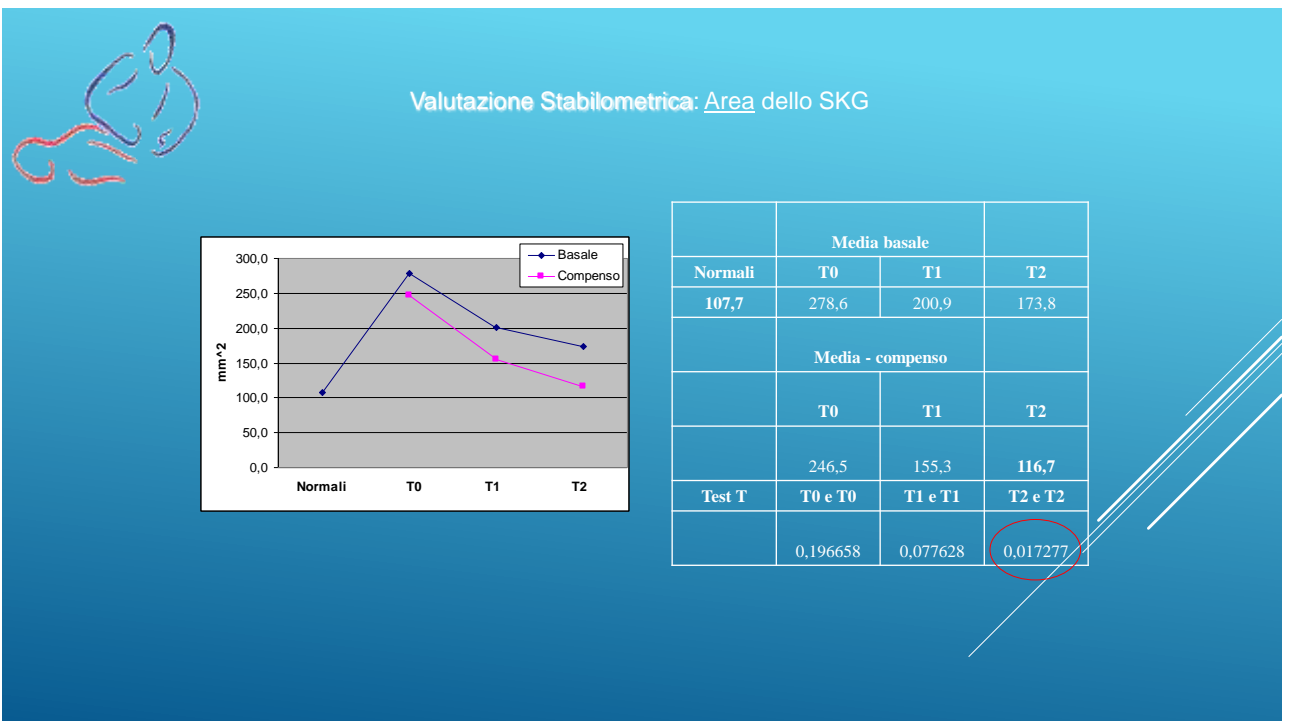
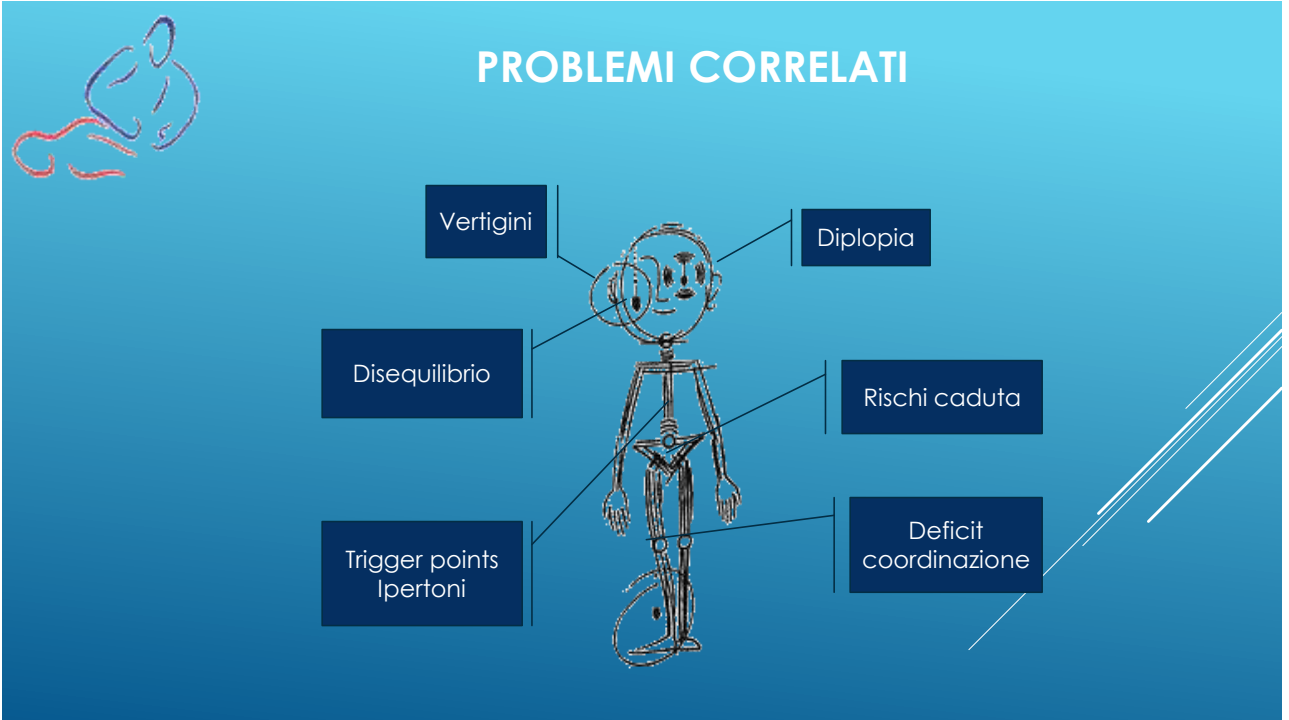


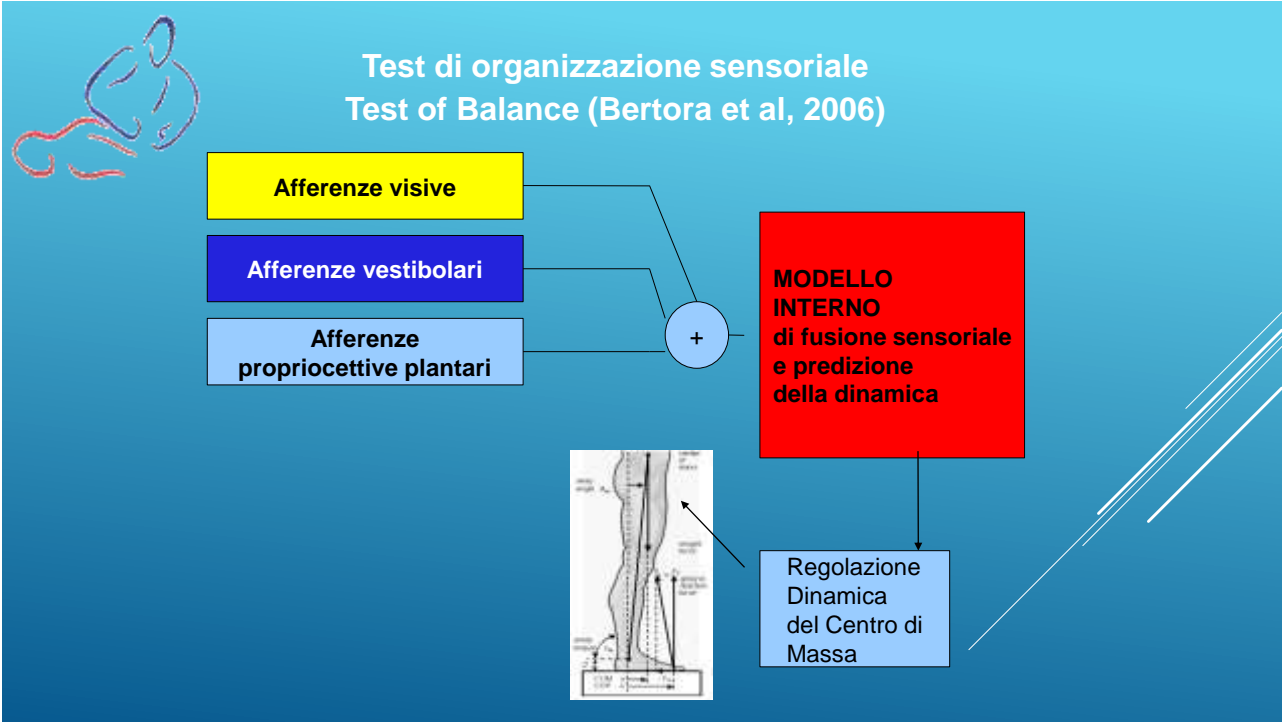
Endoentrate

Recettori articolari
Recettori tendinei e muscolari









Archives of Sensology and Neurootology in Science and Practice-ASN
XXXIII Congress of the NES - Bad Kissingen - Germany - Page 2
March 2006
<http://neurootology.org>

Bipedestation Studied by Posturography
Dr. med. Guillermo O. Bertora
Dr. Med. Julia M. Bergmann
Dipl. Ing. Daniel Comarino
Otoneuroophthalmological Neurophysiology – Buenos Aires – Argentina

Test of Balance

	40cm/s	10cm/s	100%
EOS	0.0000%	0.0000%	0.0000%
ECS	0.0000%	0.0000%	0.0000%
EOU	0.0000%	0.0000%	0.0000%
ECU	0.0000%	0.0000%	0.0000%

Velocità Angolare

EOS ECS EOU ECU

24% 28% 47%
0.5% 0.5% 0.5%

VISTA VESTIBOLO TATTO

Weighted Length
71



About Balance on Platform: Mathematical Modeling for Clinical Evaluation

Dipl. Ing. Daniel Contarino,
Dr. med. Guillermo O. Bertora - Dr. med. Julia M. Bergmann.

XXIX Congress of the NES - Bad Kissingen - Germany
March 2002

Neurofisiología Otooftalmológica

República Dominicana 3388 - 6to
B1425GKB-Buenos Aires - Argentina
Tel. 005411 4823 8454 Fax. 005411 42152359 Email otooftal@vertigo-dizziness.com

At the end of each test, the software also evaluates the **predominant direction** of the movement (angle in deg), the **area (A)** of the COG's projection in cm² and the **total displacement (TD)** or length (in cm) of the COG's projection path. Several relationships are calculated from these parameters.

The four patient's condition that define each 30 second test are:

- **Test 1:** Eyes open, stable surface (EOS) : complete equilibrium information
- **Test 2:** Eyes closed, stable surface (ECS) : somatosensory and vestibular information
- **Test 3:** Eyes open, unstable surface (EOU) : visual and vestibular information
- **Test 4:** Eyes closed, unstable surface (ECU) : vestibular information only

The unstable condition (tactile information suppressed or very attenuated) is performed using a thick foam cushion over the platform.



Let us assume that **TD** (Total Displacement in cm), **A** (Area of equilibrium in cm²) and **V** (mean COG's velocity in deg/s) **inversely** describe the patient's ability to maintain an equilibrated or stable position over the time.

The patient's stability coefficients **S_n**, are calculated as $S_n = \frac{1}{\sqrt[3]{TD_n \cdot A_n \cdot V_n}}$, where n is the

test number. The idea is combining the three **instability** parameters (TD, A and V), minimizing possible errors or artifacts in the measure process, usually seen in software that use only one parameter for the calculations.

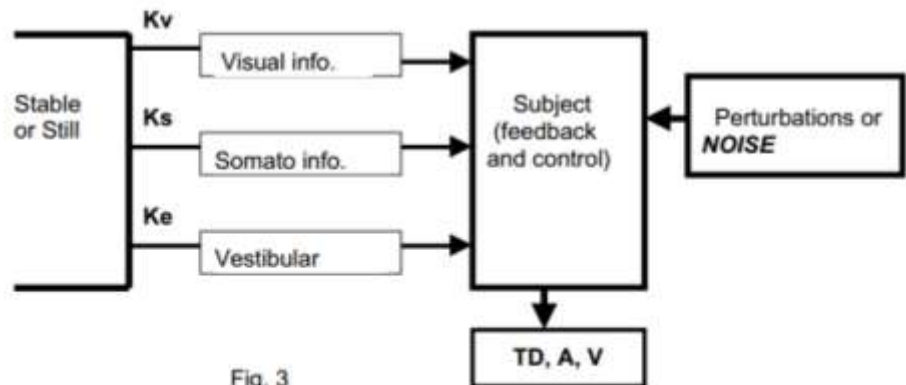


Fig. 3



Let us assume that **Kv**, **Ke** and **Ks** are the contributions of each mechanism (visual, vestibular and somatosensitive) to the patient's stability, and **Sn** the stability in test n (n=1 to 4). Making some simplifications, concerning to the different frequency response of the equilibrium control systems, we can write:

- (1) $Ks + Kv + Ke = S_1$ condition in test 1 (all system working)
- (2) $Ks + \text{---} + Ke = S_2$ condition in test 2 (no visual information)
- (3) $Kv + Ke = S_3$ condition in test 3 (no somato info)
- (4) $Ke = S_4$ condition in test 4 (only vestibular info)

(6) $Ks = S_1 - S_4$
 $Kv = S_3 - S_4$ or introducing (6) in (5) we get
 (7) $Kv \cup S_3 - S_4 \cup S_1 - S_2$

Introducing (4) in (1), (2) and (3) we get:

(5) $Ks + Kv = S_1 - S_4$

This double result for **Kv** is produced because we have four equations (tests) and only three variables. Different tests demonstrate that (7) is exact within less than 10%. We can assume **Kv** as the average between both solutions:

(8) $Kv = (S_3 - S_4 + S_1 - S_2) / 2$

We refer each contribution to the sum of (8), (6) and (4), which is $(S_3 - S_4 + S_1 + S_2) / 2$ and speaking about percentages:

$Pv = \frac{(S_3 - S_4 + S_1 - S_2)}{(S_3 - S_4 + S_1 + S_2)} * 100\%$ visual contribution to stability
 $Ps = \frac{2 * (S_2 - S_4)}{(S_3 - S_4 + S_1 + S_2)} * 100\%$ somatosensitive contribution
 $Pe = \frac{2 * S_4}{(S_3 - S_4 + S_1 + S_2)} * 100\%$ vestibular contribution



PATOLOGIE IN ESAME:

- ❖ Sclerosi Multipla
- ❖ Emiplegia Destra e Sinistra

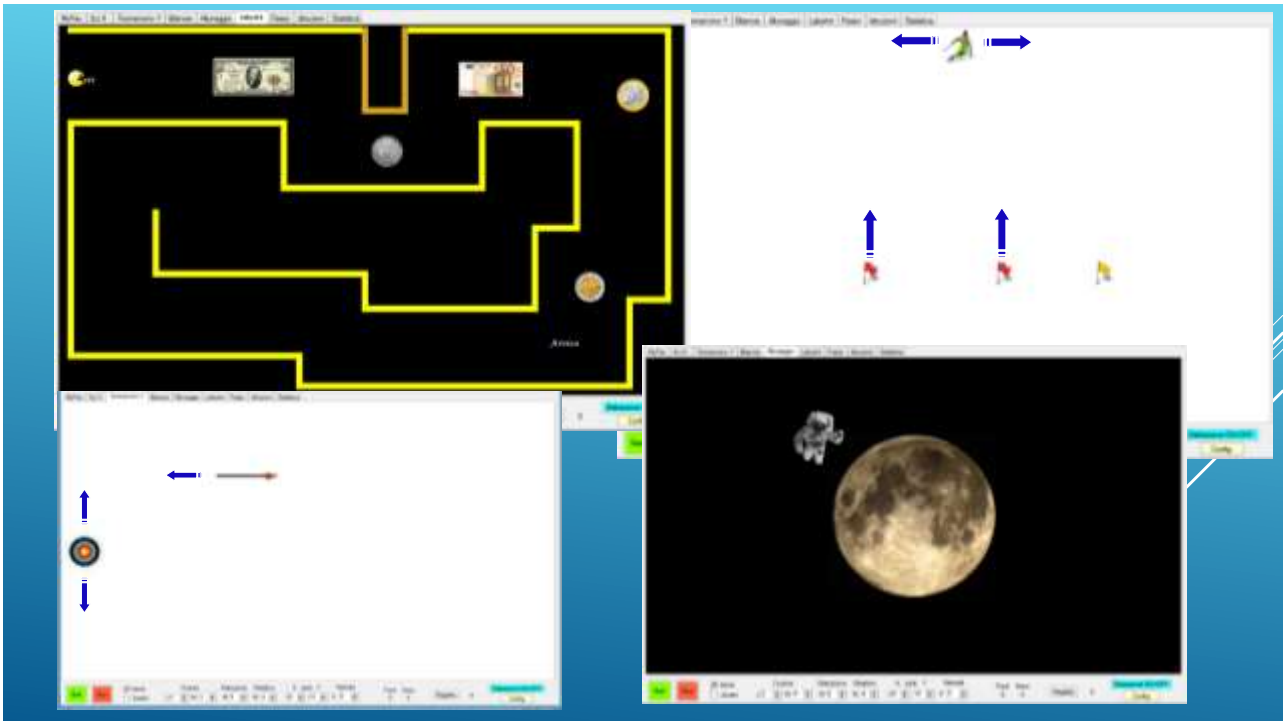


Test of Balance

T0

T1

Soggetto	T0			T1		
	Visivo	Vestibolare	Somato sensitivo	Visivo	Vestibolare	Somato sensitivo
1	23	13	64	0	12	88
2	78	22	0	59	15	26
3	47	26	27	31	16	53
4	0	0	0	15	24	61
5	55	9	36	48	15	37
6	59	0	41	38	18	44
7	0	0	0	54	10	36
8	36	14	50	28	27	45
9	0	0	0	0	0	0
10	46	12	42	45	12	43
11	31	9	60	44	8	48
Media	34.1	9.5	29.1	32.9	14.3	43.7
Mediana	36.0	9.0	36.0	38.0	15.0	44.0
dev st	26.3	9.1	25.2	20.4	7.4	21.7
	Test t T0/T1			0.864	0.168	0.050

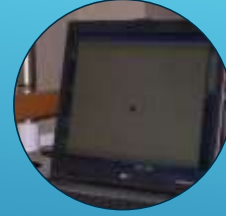








OCCHIALI PER IL RESTRINGIMENTO DEL CAMPO VISIVO

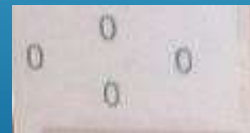


SPOSTAMENTI DI CARICO IN SENSO ANTERO – POSTERIORE

- TIROMANCINO



- BILANCE (selezionando la sola componente verticale)

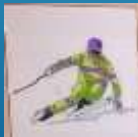


SPOSTAMENTI DI CARICO IN SENSO LATERO-LATERALE

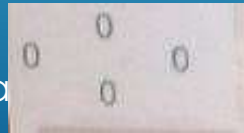
Questi esercizi possono essere proposti anche in posizione seduta per avere consapevolezza degli spostamenti di carico rilevati a livello del bacino e allo stesso tempo avere una postura più sicura e controllabile.

Gli esercizi proposti sono:

- SCI



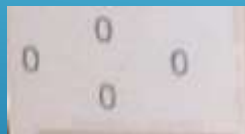
- BILANCE (sola componente orizzontale)



SPOSTAMENTI DI CARICO MULTIDIREZIONALI

1) Obiettivo variabile:

- BILANCE



2) Obiettivo fisso:

- HGATE: percorso con spostamenti maggiori in senso latero-laterale



- YGATE: percorso con spostamenti maggiori in senso antero-

IMPORTANTE LA COMPONENTE COGNITIVA

Negli esercizi proposti precedentemente è fondamentale che il soggetto usi l'attenzione durante lo svolgimento del compito

Viene proposto inoltre un esercizio che ha come presupposto sia le variazioni posturali multidirezionali che la memoria

MEMORY



www.aequabilitas.it/website/catalogo.html

Catalogo

Sezione Hardware/Software Aequabilitas

QEEG Strenuologo al servizio della clinica

ProGePaDDE
Gestione dell'ambulatorio Fisioterapico

Z-TM
Carichi ASM GD da impronta su cera.

DettoGonia
Riabilitazione Neuro-motoria

Home | Chi Siamo | Album | Contatto | **Utensili** | Altri Servizi | Amici | E-Shop | Escartini

Aequabilitas
scienza e cultura del movimento



Se l'unico strumento
che uno possiede è
il martello



..... tratterà ogni
problema come
se fosse un
chiodo !

Grazie