30, 2010, we establish the Japanese Society for Neural Repair and Neurorehabilitation (JSNRNR) and have first annual scientific meeting in Nagoya. JSNRNR is expected to facilitate wider and deeper communication among clinicians and scientists involved in neurorehabilitation.

S04.3
Neurorehabilitation in Mexico: Contrasts, Institutions and Vulnerabilities

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The health system in Mexico is functionally organized in socioeconomic groups. It divides the population into two groups: the "insured", which consists of public and private workers; social security institutes provide care in this group.
The "non government insured" which includes the middle and high class groups which can use private hospitals and clinics. The lower classes also belong to this group and the secretary of health provides medical services through its own independent public health system.
Each one of these three systems, social security, private sector and health ministry institutes, dictate their own policies and procedures, control their own budgets, and provide services independently, creating most of the time a functional redundancy.
Each system has its own rehabilitation departments, and neurological rehabilitation is provided by physical therapists mainly through the use of neurodevelopment techniques, under the supervision of a physician, rehabilitation specialist. Neurologists are not well integrated into the neurorehabilitation process.
There is no consensus in Mexican neurorehabilitation regarding evaluation scales, a common problematic issue being the application of isolated measurements for spasticity or the presence of synergies, and the lack of use of a standardized functional scale.
Neurorehabilitation professionals in Mexico are not an active research group, limiting the development of evaluation and treatment protocols based on their social, economic and cultural context, tending to copy treatment models from abroad and importing expensive technology
Rehabilitation services are provided to rural areas through so-called "basic rehabilitation units". Only two out of 31 states in the country have "community-based rehabilitation" programs, which function independent of the three health systems.
It has been suggested that improving education in rehabilitation schools and institutes can make a difference in the training of new generations of physicians and therapists, and improve patient care regardless of the system to which they belong.

SWS Scientific Workshop: Proprioceptive system in modern rehabilitation

SWS.1
The proprioceptive system, neurophysiological review

F. Gerstenbrand[1,2,3], *S. M. Golaszewski*[1,2,4];
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For any kind of body movement an efficient function of the proprioceptive system is indispensable. The "sense of locomotion" was described at the first time by J.C. Scaliger 1557. C. Bell 1826 created the term "muscle sense" as physiologic feedback mechanisms in a reverse direction after stimulation to the muscles reporting their conditions. H.C. Bastian introduced "kinaesthesia" instead of the term "muscle sense" which the idea that tendons, joints and skin producing a stimulation. 1906 C.S. Sherington introduced the term "proprioception" responsible for the awareness of movement derived from muscles, tendons and articular sources. The responsible receptors are positioned in muscles, joints and ligaments around joints. The receptors help to register tension and stretch. The information is transferred to the brain cortex using the medial lemniscus in the brainstem, the thalamus and the thalamo-cortical projection called a conscious proprioception, contrary to the unconscious proprioception as the second afferent system, but using the dorsal spinocerebellar tract (J. D. Fix, 2002). The sensorimotor area is registering the peripheral information, selecting the required afferent stimuli. Every motor activity needs correct information about the position of body and extremities.
The basis for the normal function of the proprioception is the undisturbed gravity of our planet. Disturbances as in the weightlessness, the real microgravity, bring disturbed stimulation to the brain causing misinformation for the motor system. This is producing the "cosmonaut syndrome" with typical neurological deficits. Counter measures in the real microgravity are necessary. The simulated microgravity as an experimental state, but also in patients with long-lasting coma states and with diminished motion, as well as in elderly people, is producing the so-called bed rest syndrome.

SWS.2
Brain Imaging in proprioception

S. M. Golaszewski[1,2], *F. Gerstenbrand*[3,2];
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PURPOSE: The aim of the study was to develop a paradigm for the mapping of the sensorimotor foot region in fMRI with vibrotactile stimulation. Therefore, a proper vibrotactile stimulus was developed and the elicited brain activation pattern was analyzed to find best vibration parameters and an optimized experimental protocol for the applicability of the developed paradigm in clinical functional diagnosis of the brain.
METHODES: 10 healthy male subjects (25-45yrs) were stimulated with a vibrotactile stimulus within the arch of the right foot. The stimulus was delivered through a fully automated moving magnet actuator with frequency (0-100Hz) and amplitude (0-4mm) control.
To avoid adaptation phenomena a stimulus wave form was formed as the product of a fixed vibration carrier signal and a modulation term which varied sinusoidally. The carrier frequency was held constant at 100 Hz at a fixed modulation frequency of 25Hz and a fixed stimulus intensity of 0.05N throughout the fMRI run.
Experiments were performed on a 1.5Tesla MR-scanner. For fMRI, we employed T2*-weighted EPI sequences (TR/TE/α=0, 96ms/66ms/90°, matrix=64x64, acquisition time: 2sec, voxel dimension= 4x 4x4mm). Twenty-four slices parallel to the bicommissural plane were simultaneously acquired in an event related design with randomized stimulus presentation with stimulus duration of 1 sec as a 2x2 design with vibration amplitude of 0.5 and 1 mm and a vibration frequency of 25 and 50 Hz. A total amount of 120 volume images was acquired during a single fMRI run. The scan repetition time for the

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Clinical and imaging effects of the mechanical stimulation of support zones of soles
L. A. Chernikova[1], R. N. Konovalov[1], E. I. Kremneva[1], M. V. Krotenkova[1], K. A. Melnik[2], I. V. Saenko[2], I. B. Kozlovskaya[2];
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6th World Congress for NeuroRehabiltation 2010

BOOK OF ABSTRACTS

V. Hömberg

H. Binder

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6th WORLD CONGRESS FOR NEUROREHABILITATION

vienna, austria, march 21-25, 2010

Karl Landsteiner Institute for Neurorehabilitation and Space Neurology

The Proprioceptive System, neurophysiological review

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SWS01 Adeli Scientific Workshop in modern rehabilitation
22th March, 2010

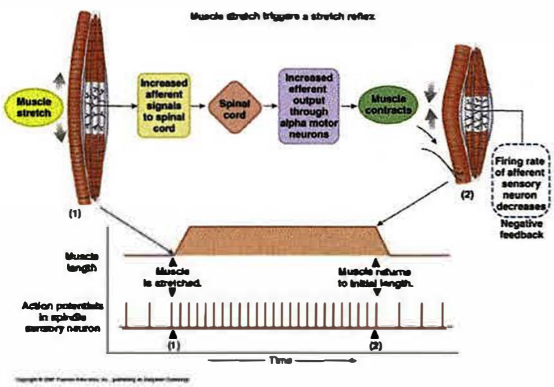
Definition of proprioception

- Proprius [lat.] = meaning „one's own"
- Perception = the sense of the relative position of neighboring parts of the body

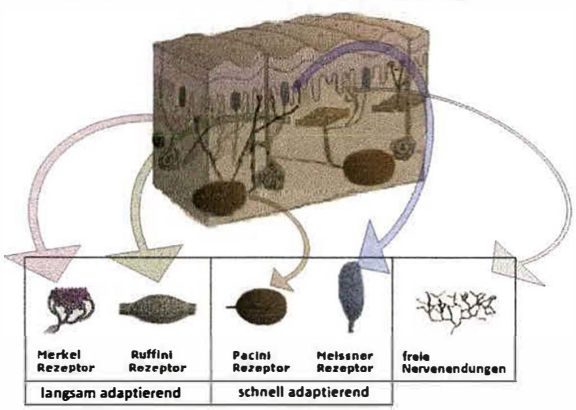
Different senses

- First modality:
  Exteroceptive senses perceiving the outside world
  - seeing, taste, smell, touch, hearing, balance
- Second modality:
  Interceptive senses perceiving pain, movement of internal organs
- Third modality provides feedback solely on the status body internally, moving of the body, location of the various parts of the body in relation to each other

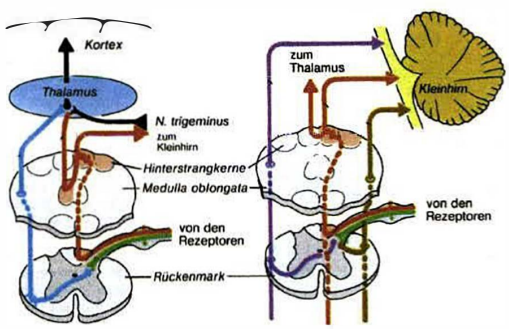
Muscle spindle function



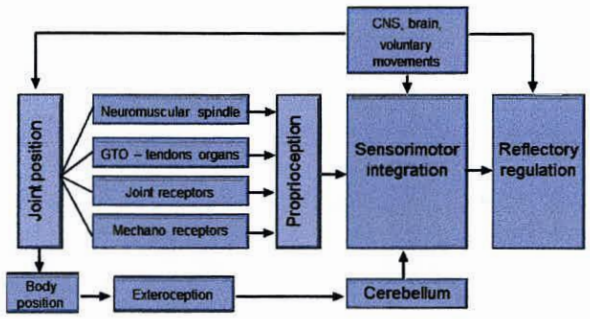
Scheme of Mechano-Receptors



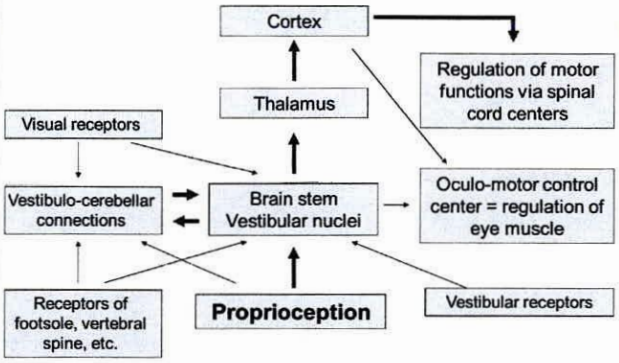
Connection of the proprioceptive system to the cortex and to the cerebellum



Scheme of the function of proprioception



Scheme of proprioceptive connections to the cortex



Function of mechanoreceptors in normal gravity, G_1

- Every movement of the whole body and its details is changing the geometry of the body, displaces the body's balance point
- Every muscle activity is accompanied of restoring force per unit area reacting of the body segments and are threating to move them
- In weightlessness new body scheme has to be created, postural corrections are introduced

Research in Microgravity

- Parable flight
- Real microgravity
- Simulated microgravity
  - Ground based laboratory

Counter Measures in Real Microgravity

- Treadmill exercises
  - Daily fixed program
- Special exercises legs and arms
- Adaptation of fine motor skills
  - Target training
- Adaptation training of cognitive functions
- Electrode trousers
- Penguin suit

Counter Measures in Real Microgravity

Cosmonauts at MIR in training

Simulated microgravity
Ground based laboratory
Special equipment necessary

- Methods
  - Bedrest system
    - Head down tilt-system – HDT
  - Body weight discharge
  - Dry water immersion model – DWI-method

Research Results
Real and Simulated Microgravity
Neuro-Rehabilitation

- Development of new methods in
  - Motoric disturbances
    - Parkinson symptoms, spasticity, cerebellar disturbances
    - Disturbances of the peripheral nerve system
  - Bedrest syndrome
  - Dementia

Neurology, Neurorehabilitation and Space Neurology in Future

- Neurological examinations, focused on simulated microgravity methods
  - Additional knowledge of the proprioceptive system (motoric system, thalamic system, higher and highest brain functions)
  - New methods in neuro-diagnosis (multiplication effect of minimal brain lesions)
  - Development of new methods in neuro-rehabilitation
- Neurological examination in real microgravity (orbit flights in ISS, moon missions, planned manned Mars mission)
- Examination in partial microgravity of underwater conditions

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SWS01

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SWS02

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