THEORY AND CLINICAL APPROACHES TO CHRONIC BACK PAIN BY SYNCHRONISM AND ENTRAINMENT*

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Basic Ideas from Bio-Physics

Vibrations and rhythms, as a result of organs and single cells, are well known in the field of clinical medicine. Also their changes until a total stop (death) have been described for decades.
In cardiology, neurology and sports medicine for example it is well established to use time patterns (cell vibrations as a result of cell activity) for diagnostics. (EKG, EEG)
On the other hand, to use specific time patterns (electrical, magnetical, mechanical, gravitational) for therapy is new and opens the new field of vibrational and regenerative medicine. (v. lat. regeneratio = Neuentstehung, a new field of Biomedicine.)

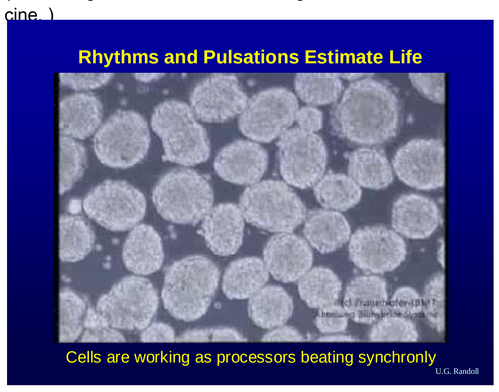

Fig. 1: Life without rhythm does not exist. Heart-cells in living cultures are selforganizing and pulsating coherently. (Film: Fraunhofer St. Ingbert)

Biophysics (Synergetics, Cybernetics, non linear thermodynamic of irreversible processes, Chaos-Theory, Chronobiology) of today gives the idea how biological structures are the result of physicochemical processes, that are driven by body intrinsic and / or body external rhythms. Such coherent bio-informative fields interact the whole span of life and stabilize dynamically.

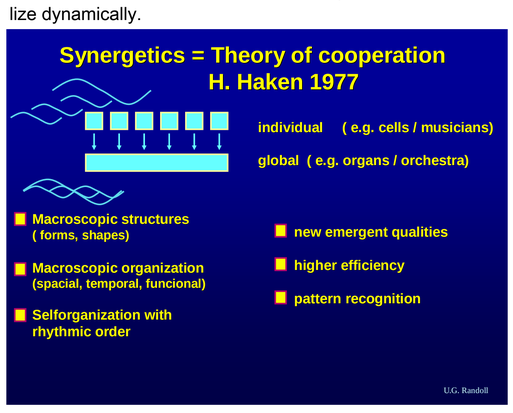

Fig. 2: The whole (organ / orchestra) is more than the addition of the parts (cells, musicians) .

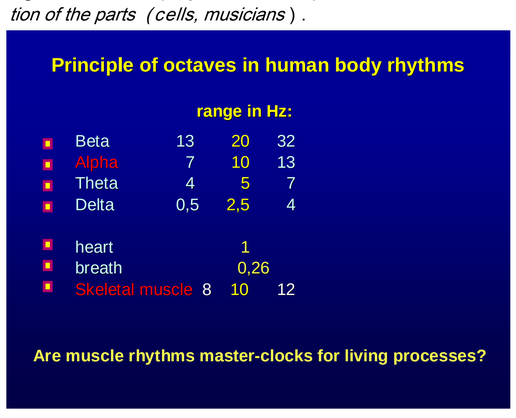

Fig. 3: " Frequency windows " in dynamic and harmonic order are the result of cell-coherence. They can be used to characterize time-patterns and body function. (Heart-rate variability etc.)

In different cells-cultures we observed changes in oscillation, cell-dynamics, differentiation and dedifferentiation depending from physico-chemical environment. By analyzing the time patterns the idea was born to stimulate by different external oscillators. As entrainment-effects, the basic effects of synchronization were observed, the question was if it would be possible to treat just by re-adaptation of time patterns to normal.

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Theory of Chronic Back Pain

Fig. 4: Rising costs from back pain in industry was the reason to look for new theoretical models for pain treatment.

Chronic back pain seen as a problem of processes and cell dynamics, makes it necessary to study time-patterns like

- time-structures in skeletal muscle
- physiological tremor,
- microvibration
- quivering of skeletal muscle

If processes become slower, cell metabolism becomes anaerob, cells are suffering, are contracting and end in rigor mortis.

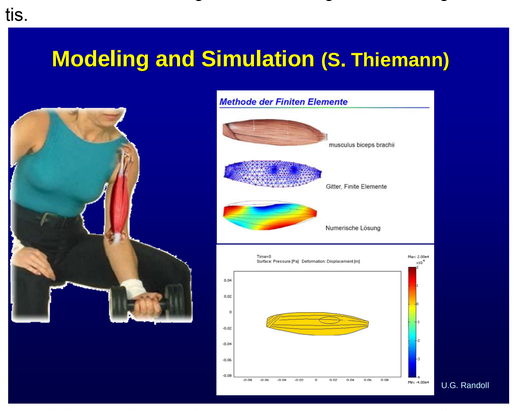

Fig. 5: Diplom Theses 2006: Modeling and numerical Simulation of Skeletal muscle. Acidotic areas as a result of cellular " logistic problems " makes musculature less elastic and plastic. Results are " Trigger points " and " Tender points"

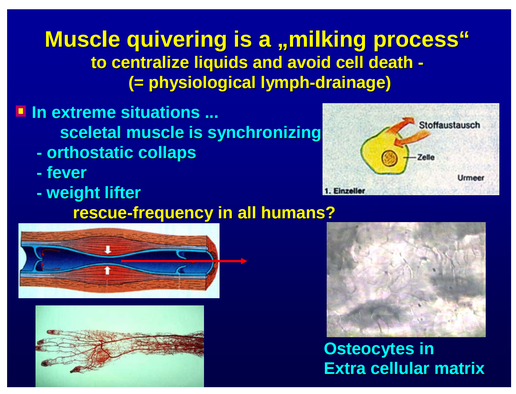

Fig. 6: Muscle quivering, a rescue frequency-window in extreme situations of the body. As physiological lymph-drainage it opens microcirculatory stops from ahead.

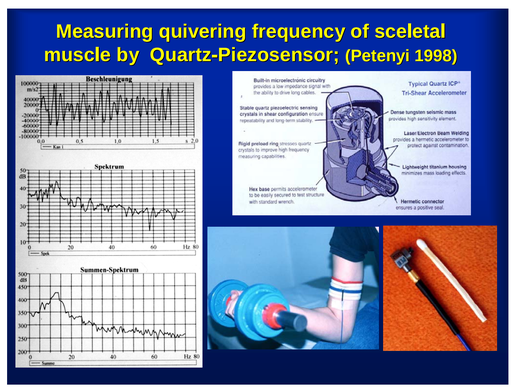

Fig. 7: Dissertation 1998, University of Erlangen showed as main result: Synchronization amplitude depends on isometric force at 8-12 Hz. (alpha-rhythm).

" Basic evolutionary time patterns ", regarded as natural conductor-frequencies are obviously disturbed in diseases like chronic back pain.
In the hierarchy of different time and space patterns treatment of chronic back pain starts on microscopic level. So disturbed (strange) attractors should be systematically re-adapted beginning from microscopic cellular level and brought back some how to a synchronous cooperation on macroscopic level.

Clinical approach

In the early 90th we already showed in high resolution video-microscops cellular oscillations depending from the physico-chemical environment. If cells get stressed, they contract. Relaxation is dependent from metabolism and "logistic" of the cells.

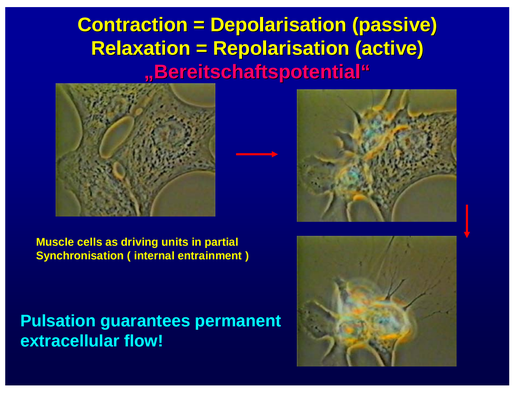

Fig. 8: Cells are unable to repolarize under stress. Video microscopy of three pulsating muscle cells show passive contraction and active relaxation depending from environment. (epigenetic)

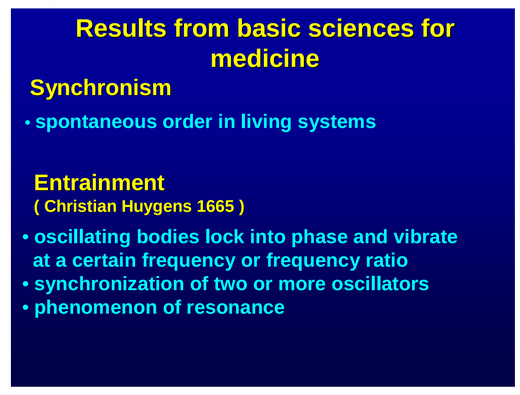

Fig. 9: Body intrinsic and body extrinsic rhythms interact with body processes. These time patterns can be used systematically for therapy.

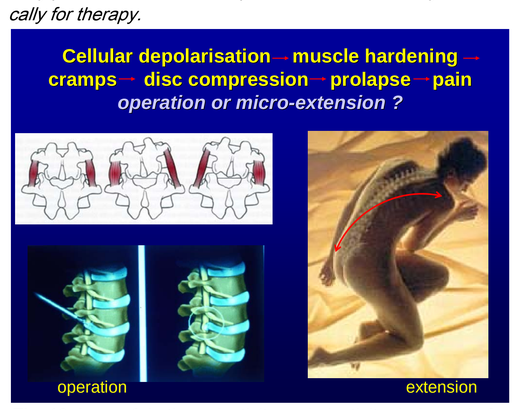

Fig. 10: Loss of rhythm, elasticity and plasticity during pain formation. When muscle cells are suffering they contract passively and enlarge disc pressure until disc rupture happens.

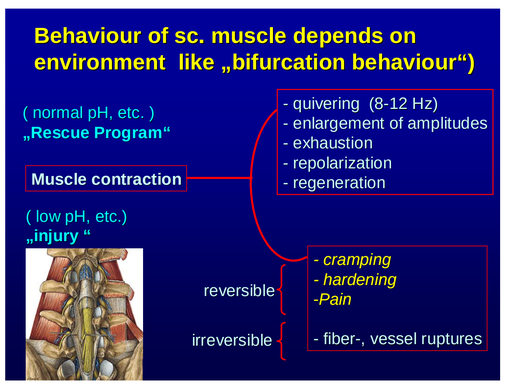

Fig.11: Skeletal muscle clearly shows "bifurcation like" behavior during contraction depending from extra cellular environment. The muscle turns either into quivering (rescue) mode or pain, cramping, hardening (injury) mode. This injury mode is clinically seen in most low back pain patients.

Contracted muscles need extension and not contraction neither actively nor passively. As most devices in physical therapies contract, it was necessary to construct a new device using bodyintrinsic rhythms for treatment.

Practical Conclusion

Following this dynamic approach we developed the Matrixmobil® for Matrix-Rhythm-Therapy (MaRhyThe), a "Rhythmic Micro-Extension-Technique". The treatment device turns the injury mode into rescue mode by entrainment. For the first time the so far neglected time-structure (time-pattern) of the organism is directly used as order parameter for the treatment. As rhythm of the skeletal muscle and the brain rhythm are connected by the "frequency-window" of 8 –12 Hz this is also the physiological link to psycho-somatic interactions.

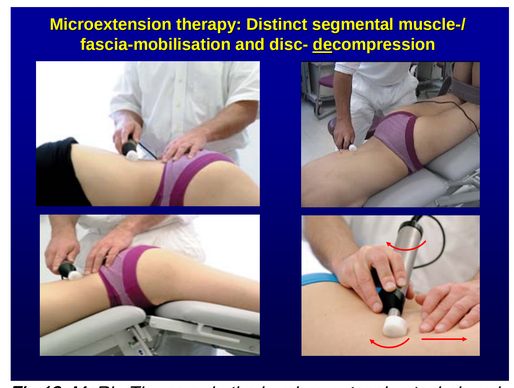

Fig.12: MaRhyThe as a rhythmic-micro-extension technique is softly applied on the painful contracted paravertebral skeletal muscle, to readapt it to normal rhythmicity and elasticity.

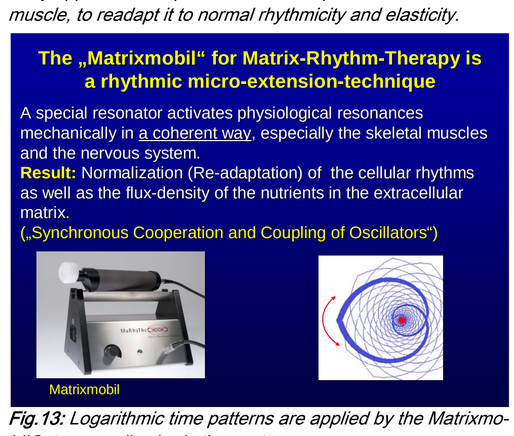

Fig.13: Logarithmic time patterns are applied by the Matrixmobil® to normalize body time patterns.

Result

Jäger A.: Der Effekt der tiefenwirksamen, rhythmischen Mikro-Extensionstechnik (Matrix-Rhythmus-Therapie) in der Bewegungstherapie. Inaugural-Dissertation zur Erlangung der Doktorwürde der Fakultät für Geistes- und Sozialwissenschaften. Univ. Hanover/LVA Baden/Württemberg 2005

Albert L.: Wirksamkeitsnachweis der Kosten-Relation des Einsatzes der Matrix-Rhythmus-Therapie in der Automobilindustrie am Beispiel der DaimlerChrysler AG am Standort Sindelfingen. Diplomarbeit zum Erlangen des Grades Diplom-Betriebswirt (FH) DIPLOMA-Fachhochschule Plauen / Vogtland Januar 2006

Sabrina T.: Modellierung und numerische Simulation der Skelettmuskulatur. Diplomarbeit; Lehrstuhl für Numerische Mathematik. TUM 2006

Felix D.: Ein Zwei-Skalen-Modell zur Simulation von Vibrationstherapien für die Skelettmuskulatur. Diplomarbeit; Lehrstuhl M2 für Numerische Mathematik. TUM 2007

Conclusion

- 1. Chronic back pain should be seen from the very beginning as a disturbance of process dynamics.
- 2. Synchronization and entrainment are the key for the treatment of disturbed biological rhythms.
- 3. Previously neglected temporal structures regain their original significance: As a consequence the treatment of back pain becomes more efficient.

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