

# Integration of Neurodynamics into Neurorehabilitation

Neurodynamic aspects in the treatment of people after complex lesions of the CNS

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Movement is the original basic of life. (Hüter-Becker 1997). You cannot explain it as a biomechanical-functional-anatomical fact, but it enables the individual in form of an expression to contact the environment. (Hüter-Becker 2002). In the same way the individual uses movement to understand others. It allows a special way of admittance. (Scheel 2012).

Possible limiting structures:  
    muscles activ / passiv  
    joints  
    neural structures

Processing in the brain can be responsible as well for limiting movement, either by disturbances in planning a movement, by disturbances in processing the incoming stimuli including pain, like allodynia, by disturbances during the execution of a movement due to poor feedback, or because of a lack of ability to recognize, evaluate and in case negotiate disturbances from outside. Therefore you might observe unexpected reactions and a changed movement behaviour.

Could the movement behaviour be influenced negatively by a lack of mobility of neural structures?

- The body is the container of the nervous system.

- The nervous system is dependant upon best conditions of its surroundings.
- If there is a mechanical dysfunction of the mechanical interface, it has a negative influence to the nervous system and can lead to an abnormal function. (Shacklock 2006).
- Muscles are the biggest MI for the nervous system, and therefore quite often be the reason for nerve irritation. (Gautschi 2010).
- Voluntary muscle contraction is controlled by the central nervous system (Wikipedia.org - muscle contraction).

Typical for a changed movement behaviour after a lesion of the CNS are:

- evasive movements instead of focused, selective movements
- stereotype movements instead of adapted, varied strategies
- distortions (children), deformities and bad posture instead of postural righting reactions,
- Motivation deficit instead of interest and joy on experiencing and learning new movement strategies.

The nervous system always has to adapt to every single movement:

- biomechanically: unfolding, extra- and intraneurale gliding, compression due to muscle activity, movement or postures, but only little elasticity

- physiologically: intraneural blood supply, activation of the autonomic system, afferent and efferent impulse transport, orthodrom and antidromv axoplasmatic flow

Intraneural blood supply: with 8% extension reduced circulation, with 15% no longer oxygen supply guaranteed. (Lundborg & Rydevik 1973, Ogata & Naito 1986).

Neurodynamics describes the interdependant relationship of the physiological and biomechanical properties of the nervous system (Shacklock 1995, 2006).

That means: each lesion of the CNS has consequences for the PNS. And every mechanic influence to the nervous system has repercussions to its physiology.

Grieve 1970 described the sensitivity especially of neural tissue with inflammation. Nervi nervorum (Bove & Light 1995) and dura mater (Fricke et al.2001) have nociceptors that are sensitiv to chemical or mechanical irriation, like

tension or compression, and then are showing signs of inflammation. This so called mechanosensitivity can lead to pain during movements, therefore movement might be reduced or stopped, and especially passive movements can lead to evasive reactions, counteractions and even aggressive behaviour.

Example of a neurodynamic test for the sacral plexus, including all components. The release position (Kern 2010) is the typical spastic flexion pattern in the leg. Too much tension / sensitivity in the sacral plexus could be the reason for the sliding forward in the wheelchair, because the pelvis is being pulled backwards, therefore the trunk is leaning backwards or even pushes back. The individual has no other possibility to get release for this irritation of the sacral plexus or peripheral nerves belonging to it.

Leaning forward is important for standing up, for many other activities of daily life, but as well for body language.

Neuraxis - Slump-Test, release position is opisthotone.

Could we still interpret that a lack of postural control is the only responsible fact for a bad sitting posture? Or lack of muscle power? Maximal muscle power develops in midposition, in a limit position a muscle is weak, non selective, non precisely, the sensation is less, the endurance and motivation as well. Therefore we have to increase the range of motion in order to get muscle strength.

Important is especially mobilisation of the trunk into all directions to regain the midposition / symmetry.

Brachial plexus - neurodynamic test and release position.

Dr.Rolf Pfeiffer 2009 - How the body shapes the way we think, embodied cognitive science - and T.Fuchs 2009, Without body there is no need for a thinking brain: Do we put enough attention to the body structures and their limitations?