

# Frühe Intervention I Interdisziplinäre Konzepte

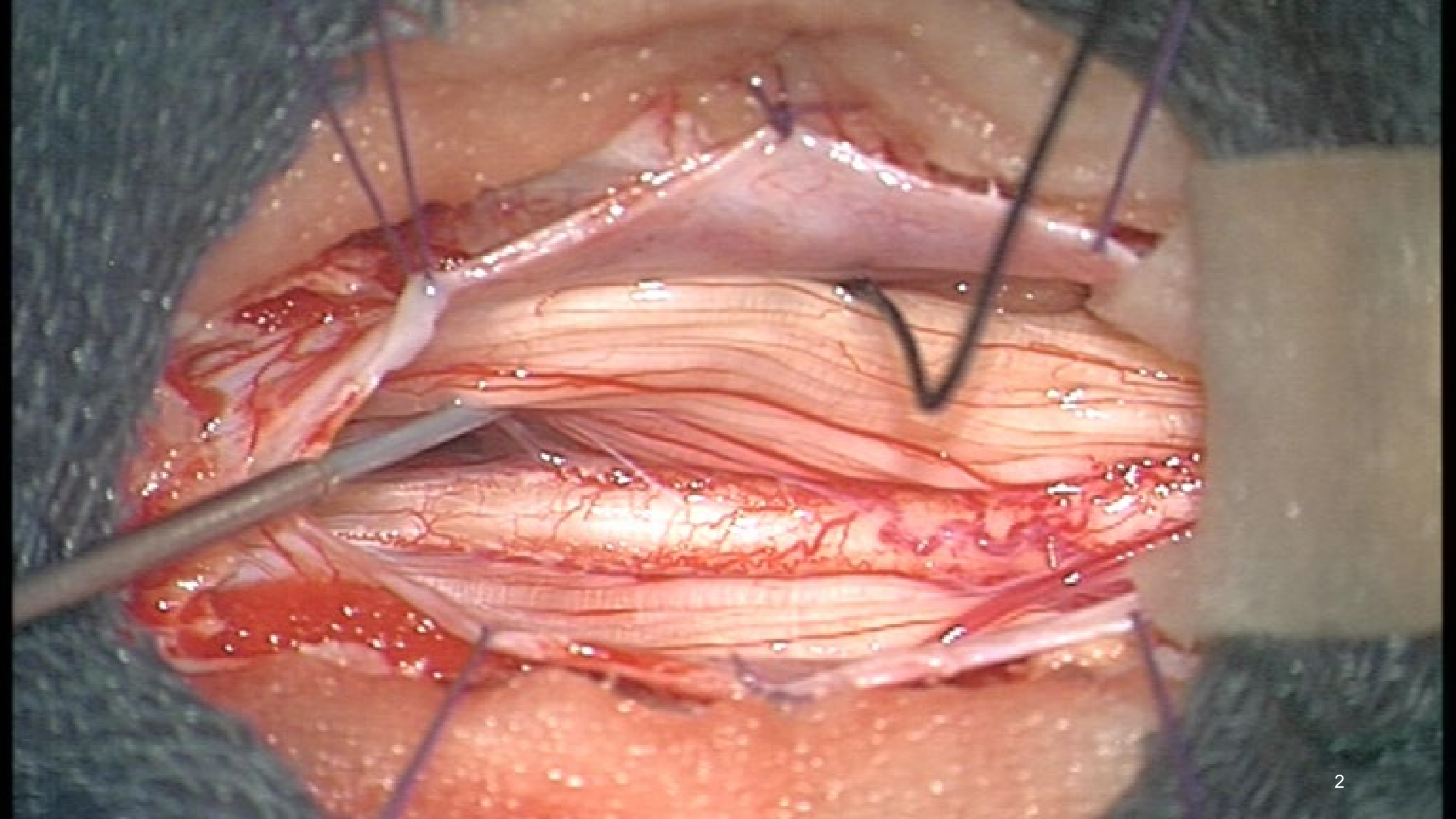



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Häufige Beobachtungen vor 1200  
standardisierten systematischen Eingriffen

**Sehr frühes Auftreten von Muskelretraktionen**

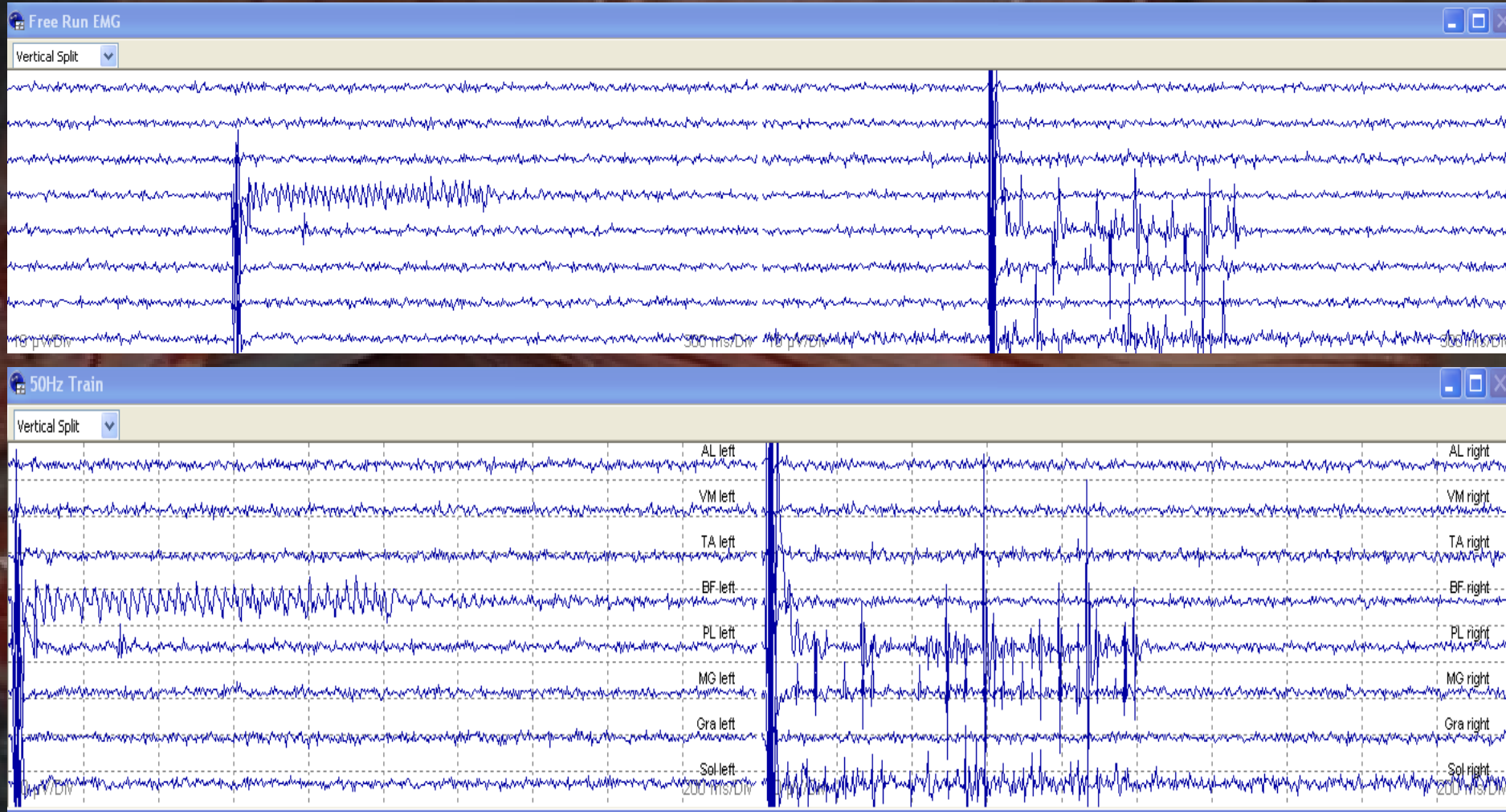
Selten rein "spastische" Bewegungsstörung

**Häufige dystonen Bewegungskomponenten ohne MRT Korrelat**

**Häufige Co-Contraktionen**

Häufige Einschränkung der selektiven Bewegungsansteuerung

# Häufige Beobachtungen während 1200 standardisierten systematischen Eingriffen



Häufige Beobachtungen nach > 1200  
standardisierten systematischen Eingriffen

**Zuverlässige Effekte an den UE:**

Reduktion der Hyperreflexie 95-100 %  
Tonusnormalisierung 95-100 %

**Häufige Effekte:**

Verbesserung der Selektivität der Bewegungsansteuerung

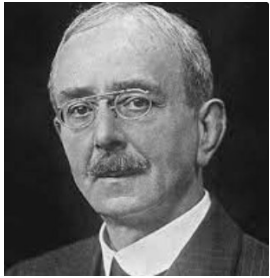
Verbesserung der Feinmotorik OE (GMFCS II – V)

Verringerung des Speichelflusses (GMFCS IV-V)

Verbesserung der Phonetik (GMFCS IV\_V)

Deutlicher Gewinn an körperlichem Wohlbefinden

# Understanding Spasticity / Landmarks



Sherrington

1896

Supra-spinal origin

Hyperreflexia caused by supraspinal loss of inhibition



Borsini

1911

Spinal compensation

Modulation of spinal inhibitory Interneurons



Lance

1980

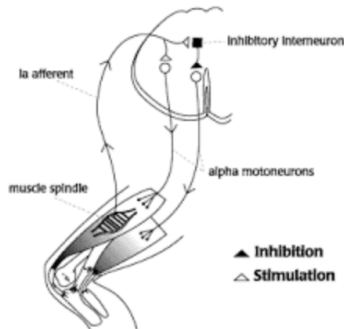
Speed Dependency of Hyperreflexia

?

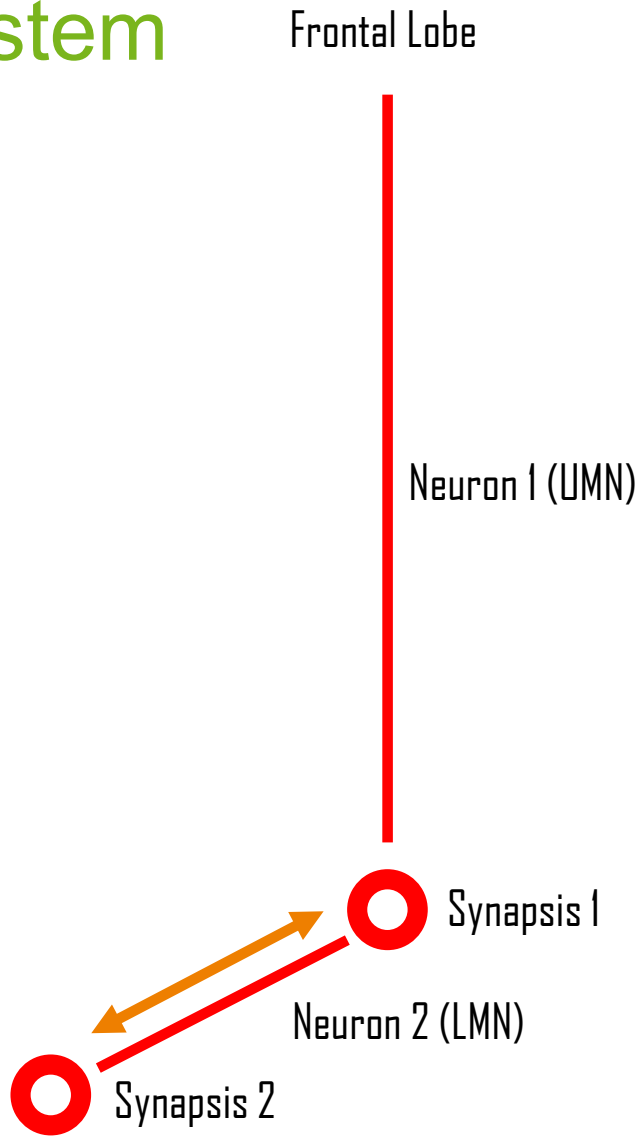
"On Reciprocal Innervation of Antagonistic Muscles. Third Note." By C. S. SHERRINGTON, M.A., M.D., F.R.S., Holt Professor of Physiology, University College, Liverpool. Received December 29, 1896,—Read January 21, 1897.

In a former number\* of these 'Proceedings' attention was drawn to a particular form of correlation existing between the activity of antagonistic muscles. In it, one muscle of an antagonistic couple is, it was shown, relaxed in accompaniment with active contraction of its mechanical opponent. The instance then cited was afforded by certain of the extrinsic muscles of the eyeball, but I had previously noted indications of a like arrangement in studying the reflex actions affecting the muscles at the ankle-joint of the frog,† and it seemed probable that the kind of co-operative co-ordination demonstrated for the ocular muscles might be of extended application and occur in various motile regions of the body. The observations to be mentioned below do actually extend this kind of reciprocal innervation

\* Vol. 52, April, 1893. Sherrington.  
† Foster's 'Journ. of Physiol.', vol. 13, 1892.



# The Pyramidal System



The Pyramidal System

Spinal

Reorganisation  
Muscle Retraction

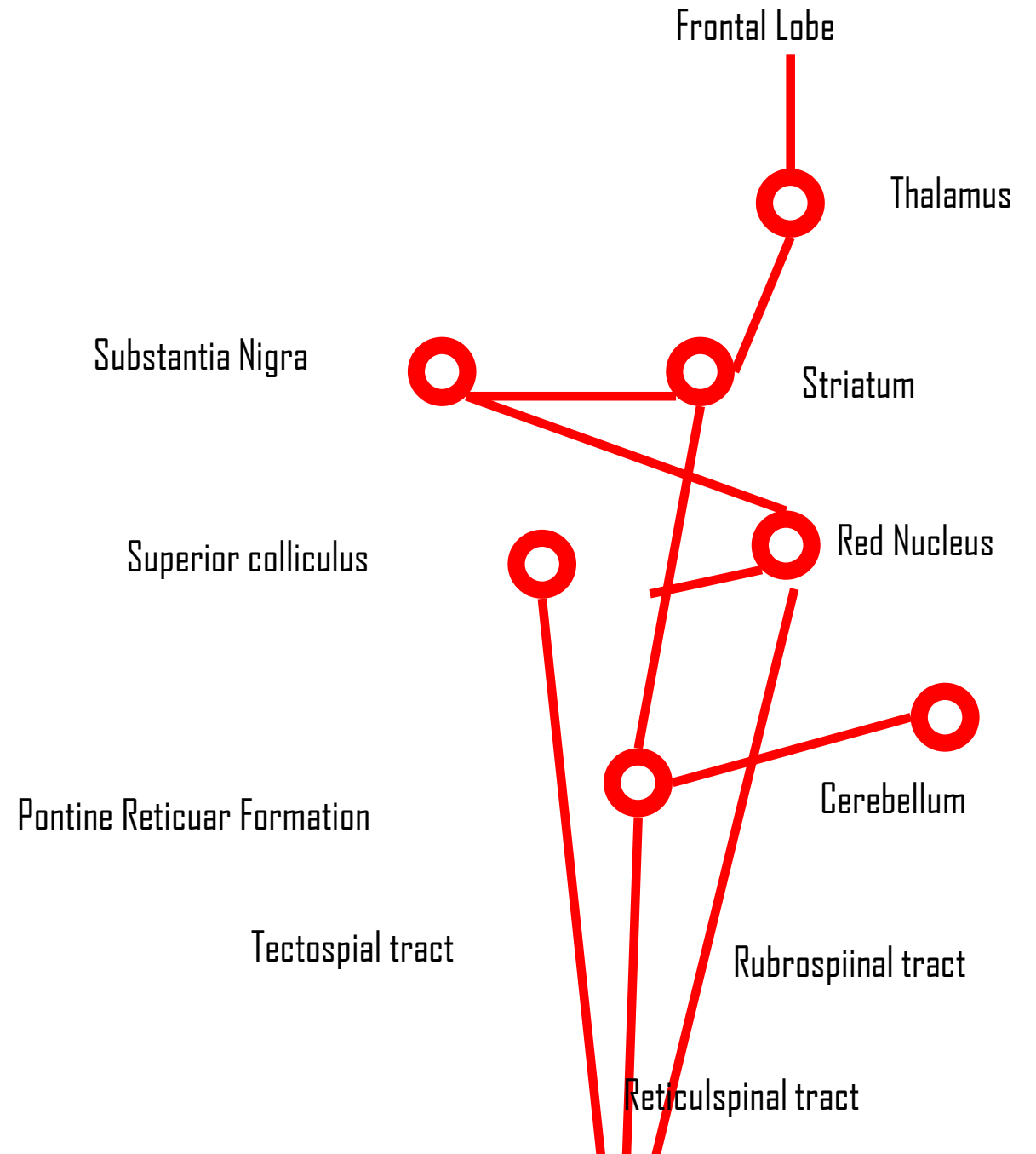
The Extrapyramidal System  
Dystonia

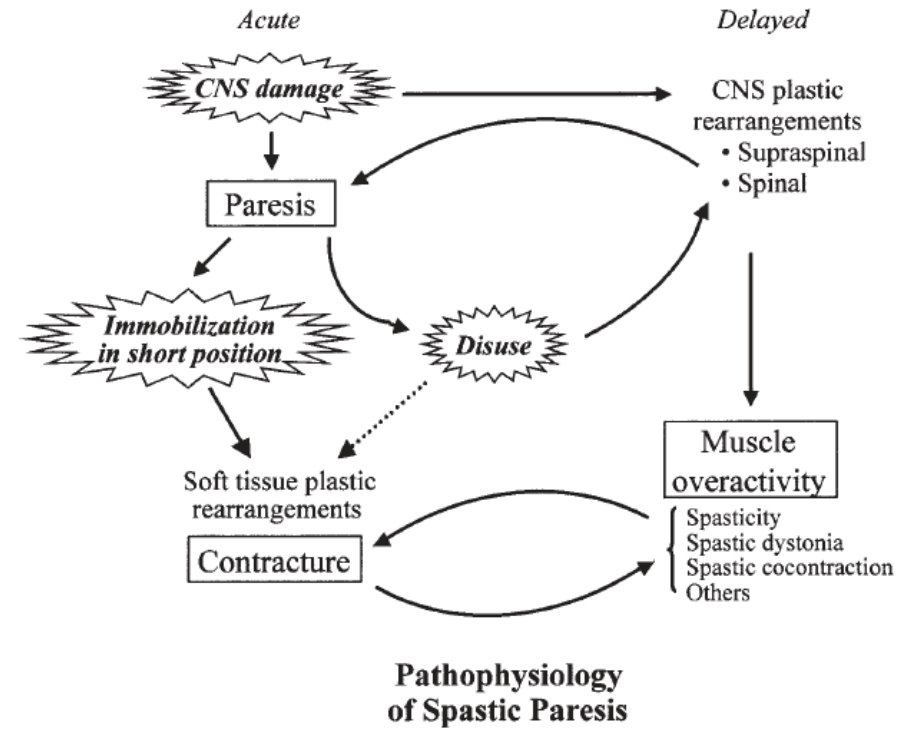
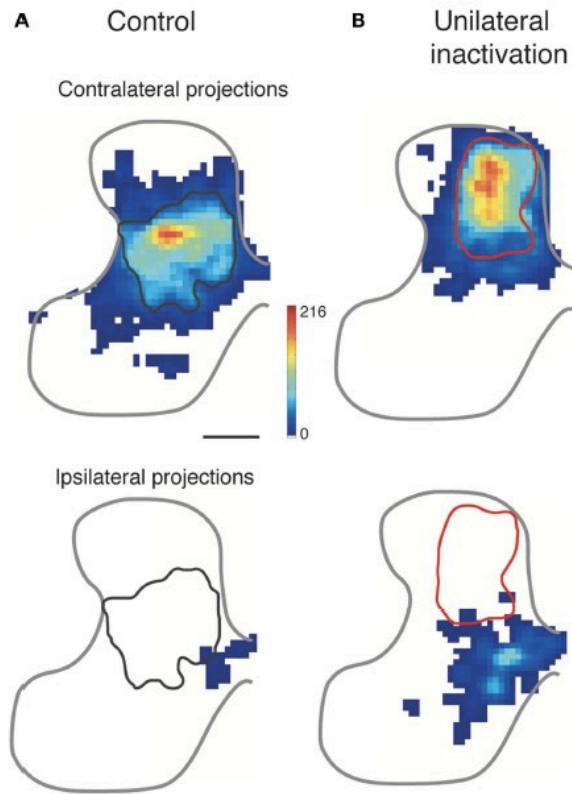




# The Bad

Extrapyramidal System  
Dystonia





# The Ugly

Spinal Reorganisation  
Retraction

# Dystonia



**involuntary maintained contraction  
of  
agonist and antagonist muscles**



abnormal posturing,  
twisting  
repetitive movements,  
tremulous m.

**Dystonia is a dynamic disorder that changes in severity based on the activity and posture.**

Dystonia is worsened by stress, fatigue, anxiety, or lack of sleep.  
can be initiated or worsened by attempted movement.

## Dystonia is a structural disorder

**dysfunction of the basal ganglia,**

( basal ganglia as the brain region responsible for integrating motor control.)

**secondary dystonia is often due to lesions of the basal ganglia, specifically the putamen or globus pallidus.**

## Dystonia is a neuro-functional disorder

**abnormal connectivity that may occur in a structurally normal-appearing brain**

- absence of neurodegeneration in primary dystonia,
- lesions of brain regions other than the basal ganglia can cause secondary dystonia,
- evidence of dysfunction in almost every region of the central nervous system involved in motor control and sensorimotor integration, including cortex, brainstem, cerebellum, and spinal cord.

# These 1

Die cerebrale Schädigung bei CP Kindern führt zu einer **neurofunktionellen Kommunikationsstörung**, die viel häufiger als bisher angenommen **extrapyramidale Einflüsse** aktiviert.

Der Begriff der **spastischen Dystonie** aus der Erwachsenenmedizin sollte auch in der Pädiatrie Eingang finden.

# Understanding Spasticity / Landmarks



Sherrington

1896

Supra-spinal origin

Hyperreflexia caused by supraspinal loss of inhibition



Babinski

1912

Spinal component

Modulation of spinal inhibitory interneurons



Lance

1980

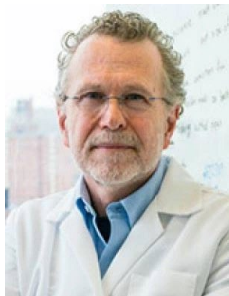
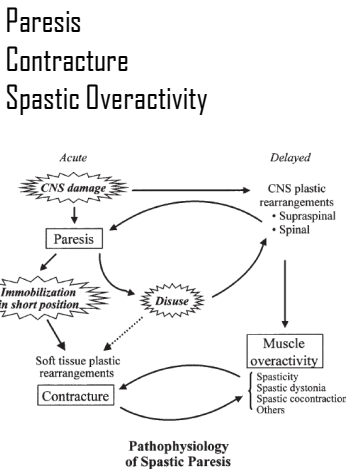
Speed Dependency of Hyperreflexia Pathophysiology



Gracies

2005

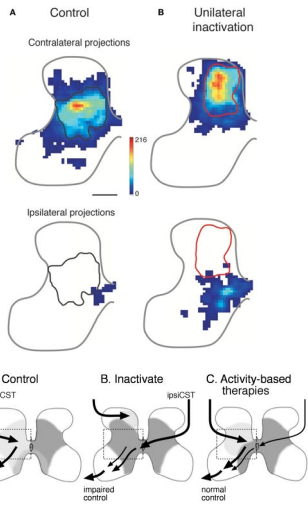
Pathophysiological Cascade



Martin

2014

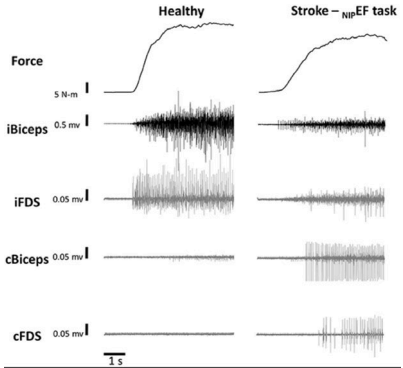
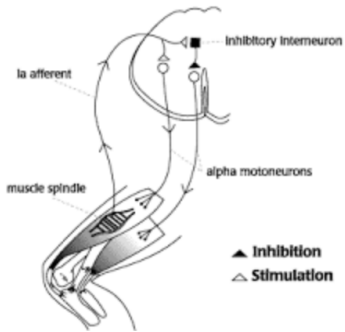
Morphologic Spinal Reorganisation



“On Reciprocal Innervation of Antagonistic Muscles. Third Note.” By C. S. SHERRINGTON, M.A., M.D., F.R.S., Holt Professor of Physiology, University College, Liverpool. Received December 29, 1896.—Read January 21, 1897.

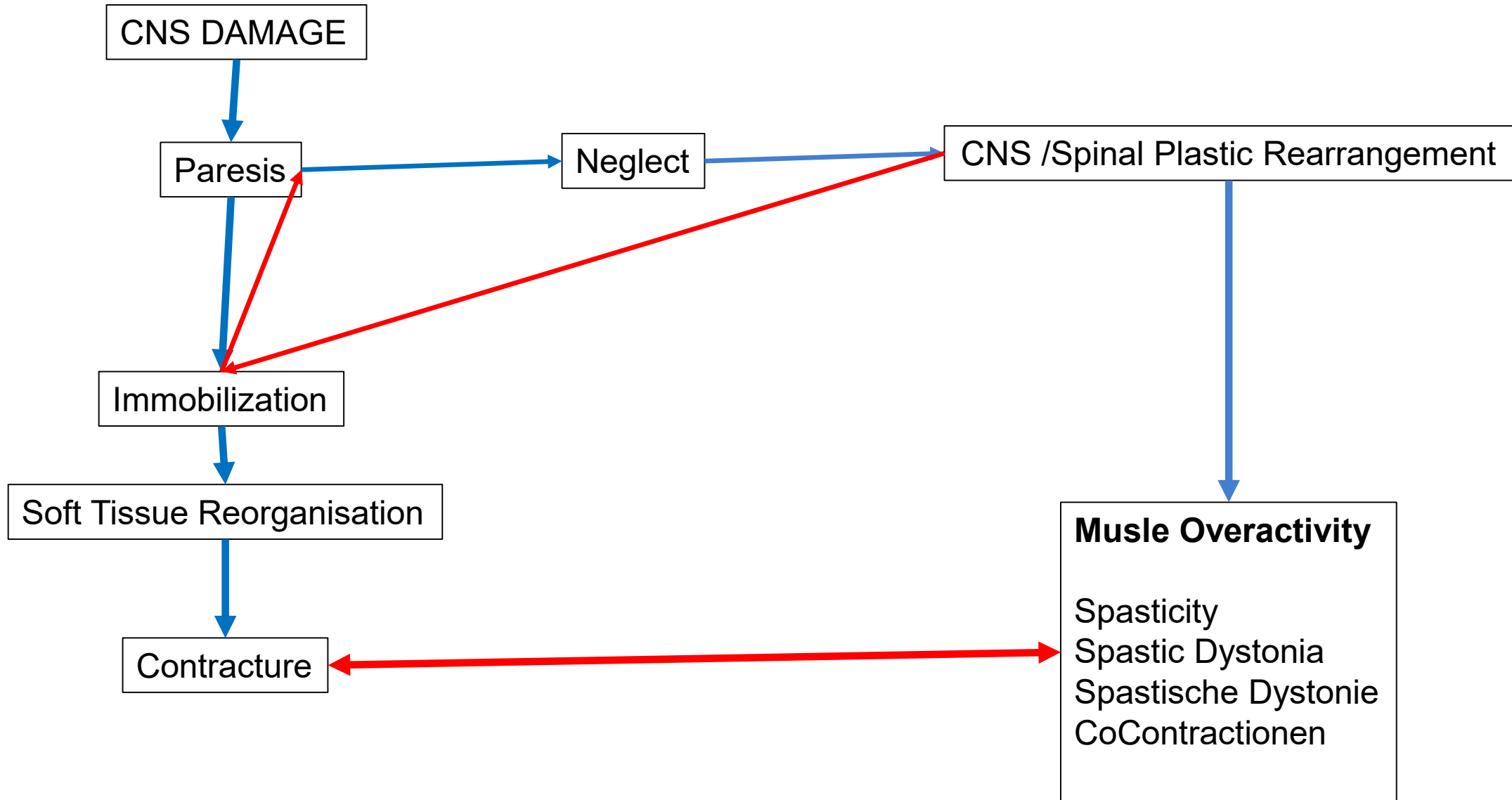
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# ACUTE (Days)

# DELAYED (weeks)



## **These Nr. 2**

Unser Mantra von der Schädigung des Muskels durch die Spastik muss überdacht werden:

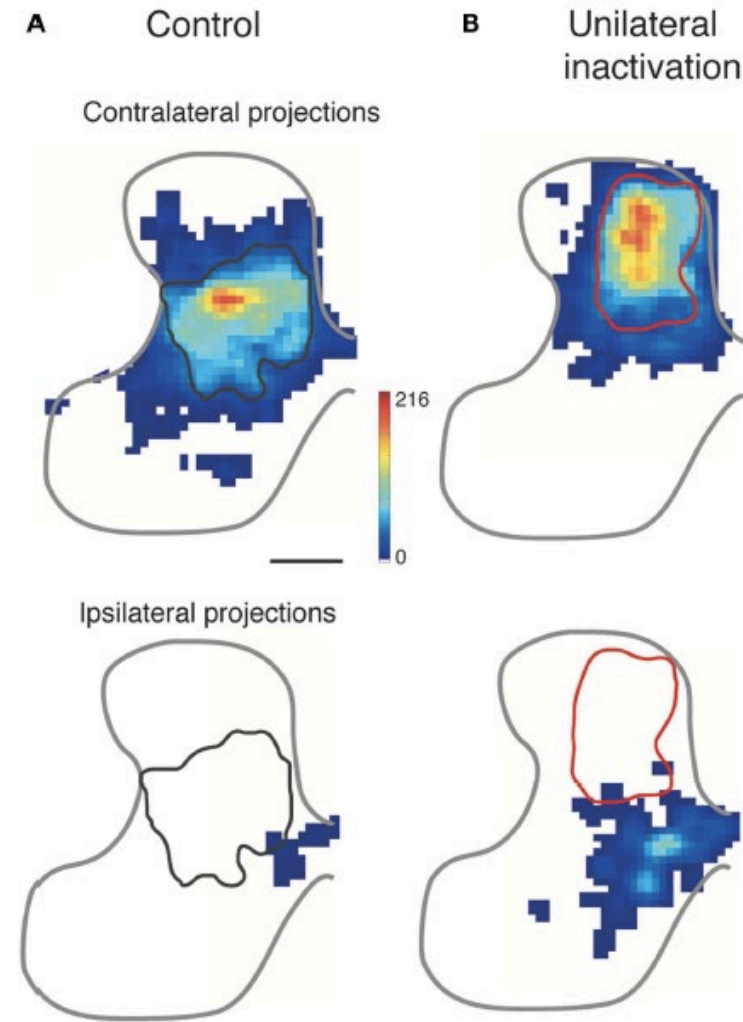
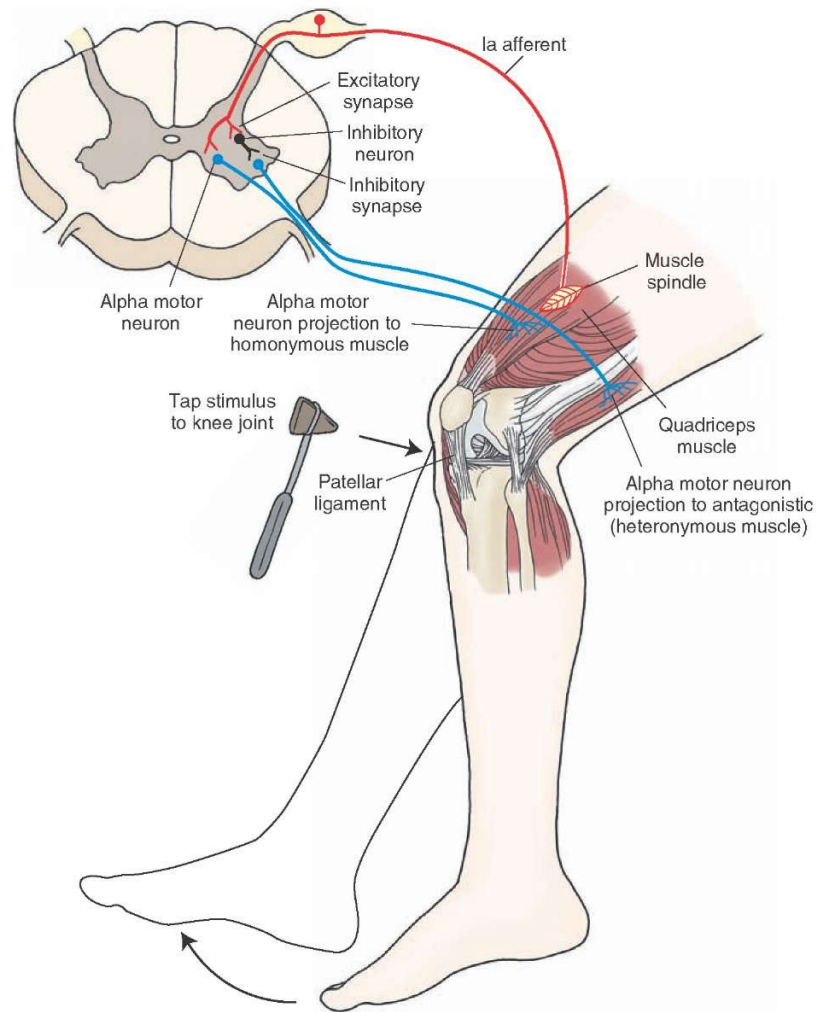
**primäre Ursache der Muskelretraktion ist die Immobilisierung**

Therapiekonzepte die mit einer Immobilisierung arbeiten sind aus muskulärer Sicht kontraproduktiv.

**Die frühe Intervention muss mobilitätserhaltend sein**



# Consequences of Corticospinal System Injury



Activity-based therapies for repair of the corticospinal system injured during development  
Kathleen M. Friell, 2\*, Preston T. J. A. Williams, 3, Najat Serradj, 3, Samit Chakrabarty, 4 and John H. Martin, 3, 5\*

## These Nr. 3

Die Kombination aus cerebraler Schädigung und Störfeuer der muskulären Efferenzen (Gracies) führt zu einer (reversiblen) spinalen Reorganisation mit **Aufhebung der segmentalen Signalverarbeitung.**

**Die späte Intervention ist ein Nachteil**

die frühe Tonussenkung durch die SDR kann nur erfolgreich sein, wenn sie systematisch **an allen erreichbaren Wurzeln (TH12-L2) durchgeführt wird**

**Die unvollständige SDR ist kontraindiziert**

