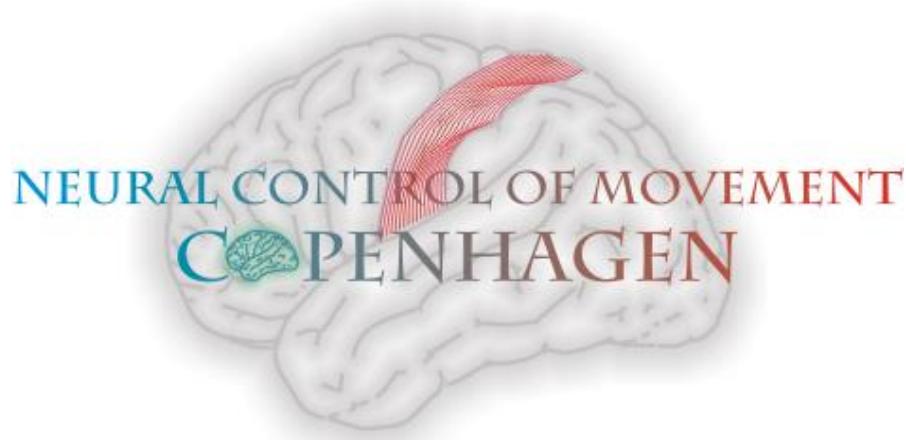


Hvad er spasticitet?



Jens Bo Nielsen

Department of Neuroscience and Pharmacology

Panum

Københavns Universitet

&

Helene Elsass center

E-mail: JBNielsen@sund.ku.dk

Hvorfra stammer begrebet?

- **Lat.** Spasticus; at trække mod sig selv. (<http://zeus.atilf.fr/tlf.htm>)
- **1500-1600** Sammentrækning omkring sår
- **1753** *Podagra smertefuld tilstand med muskelsammentrækning* (<http://www.oed.com/>)
- **1822-7** Nedsat elasticitet i muskelfibre. (<http://www.oed.com/>)
- **1880-?** Increased velocity-dependent resistance of muscle to stretch (Lance 1980)



Changes in muscle resistance

- Spasticity: velocity-dependent increase in resistance to passive stretch of muscle, reflex activation of muscle
- Dystonia: static or dynamic change in muscle tone caused by (involuntary) activation from CNS (basal ganglia affection)
- Contractures: changes in passive properties of muscles
- Spasms: lasting muscle activity elicited by sensory event
- Inability to relax

Changes in muscle resistance

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- Contractures: changes in passive properties of muscles
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Are often merged in the clinic into one term:
spasticity

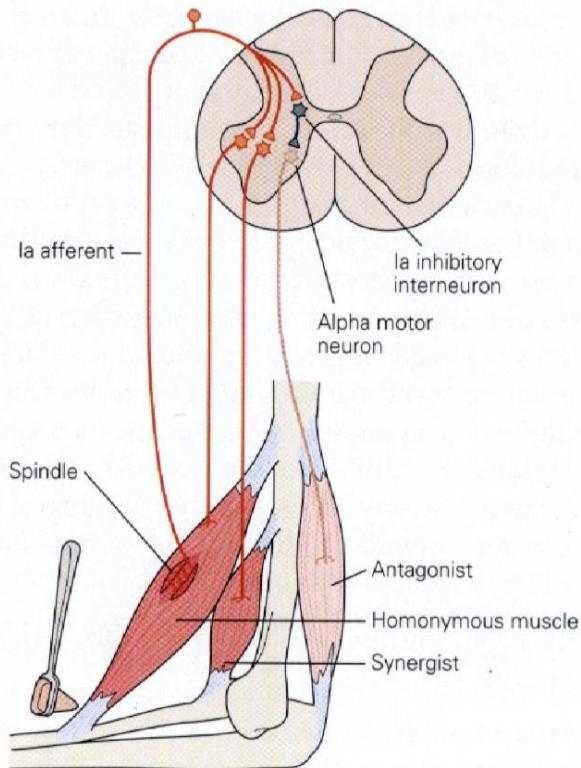
Behandling afhænger af symptom

- Spasticitet: Behandling nødvendig/hensigtsmæssig.? Fysioterapi, træning, antispastisk medicinering (ikke botox!)
- Dystoni: Muligvis Botox, men langsigtet virkning ikke klart dokumenteret
- Kontrakturer: Udstrækning , gipsning, men dokumentation for langsigtet effekt mangler
- Spasmer: Behandling nødvendig/Hensigtsmæssig? Antispastisk medicinering

Definition af spasticitet

Er det den vi skal acceptere?

B₁ Stretch reflex

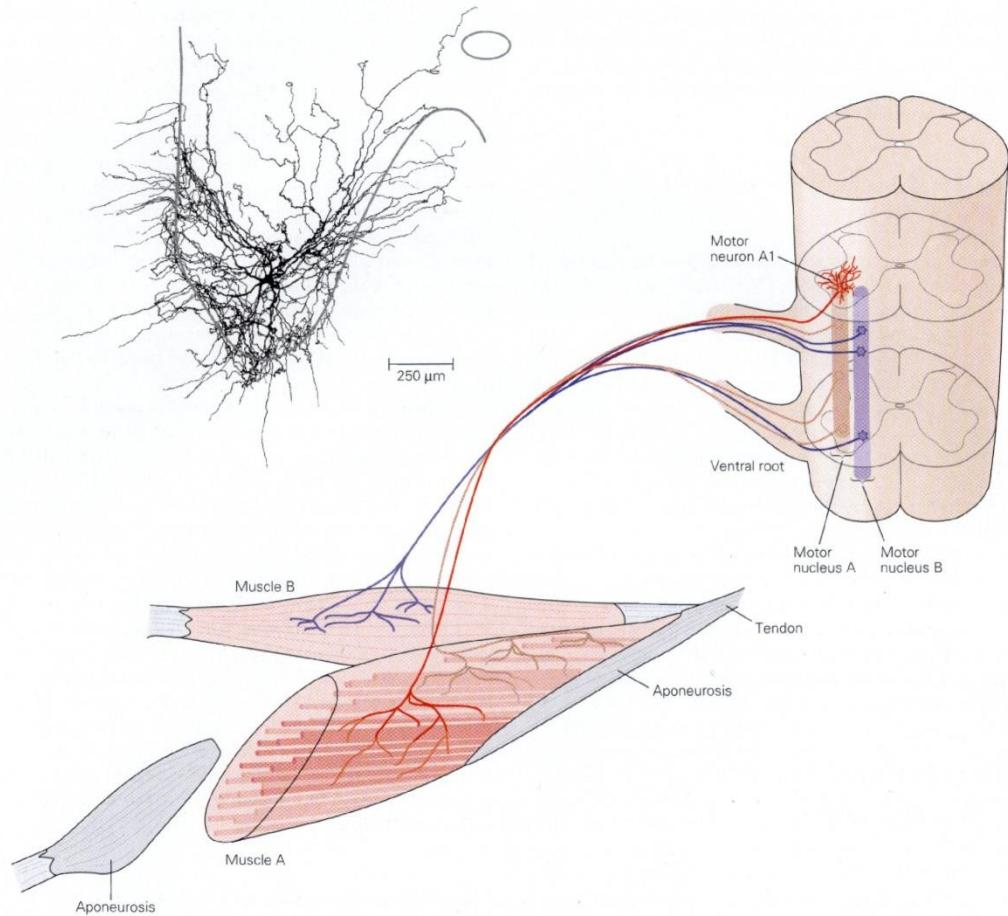


Spasticity is a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes ('muscle tone') with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex, as one component of the upper motor neuron syndrome.

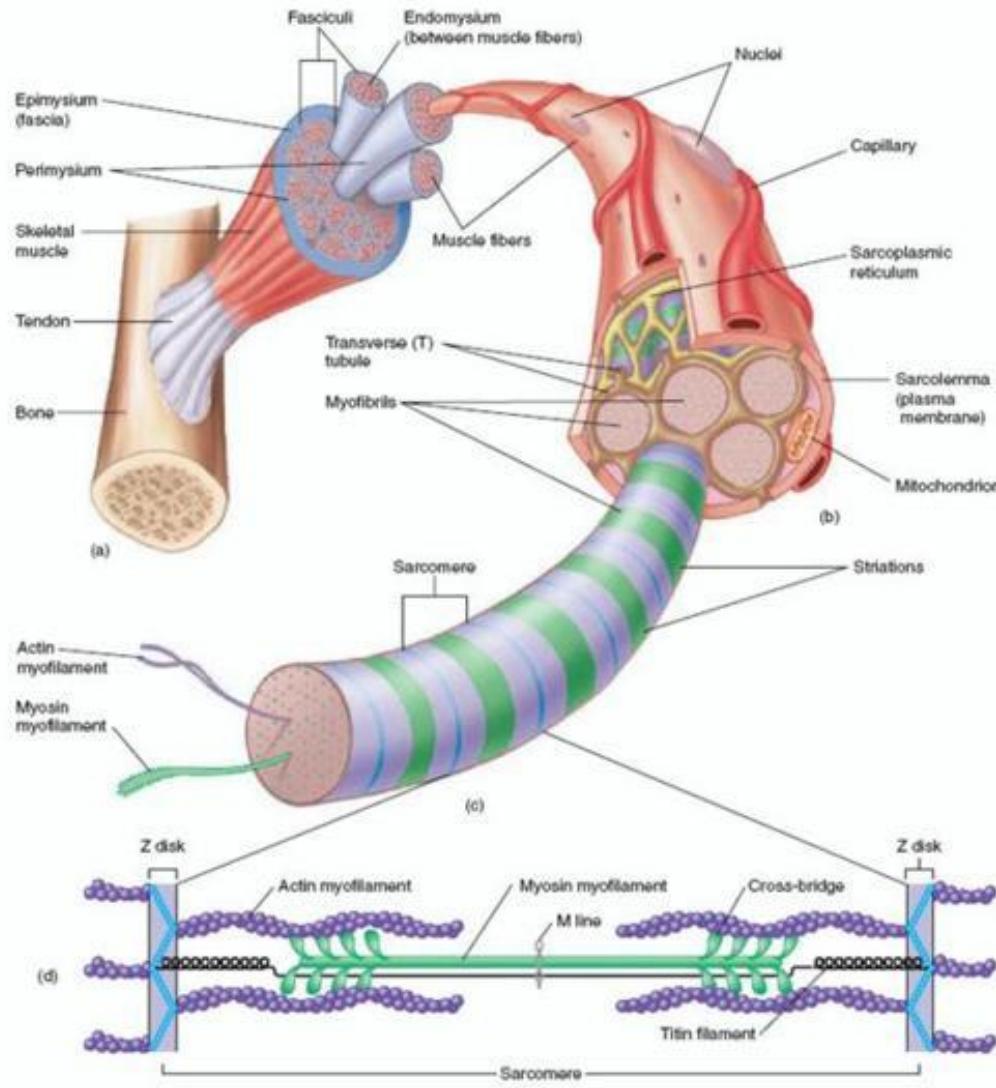
Lance, Spasticity: Disordered Motor Control 1980

Back to basics: Hvad bestemmer muskel 'tonus'?

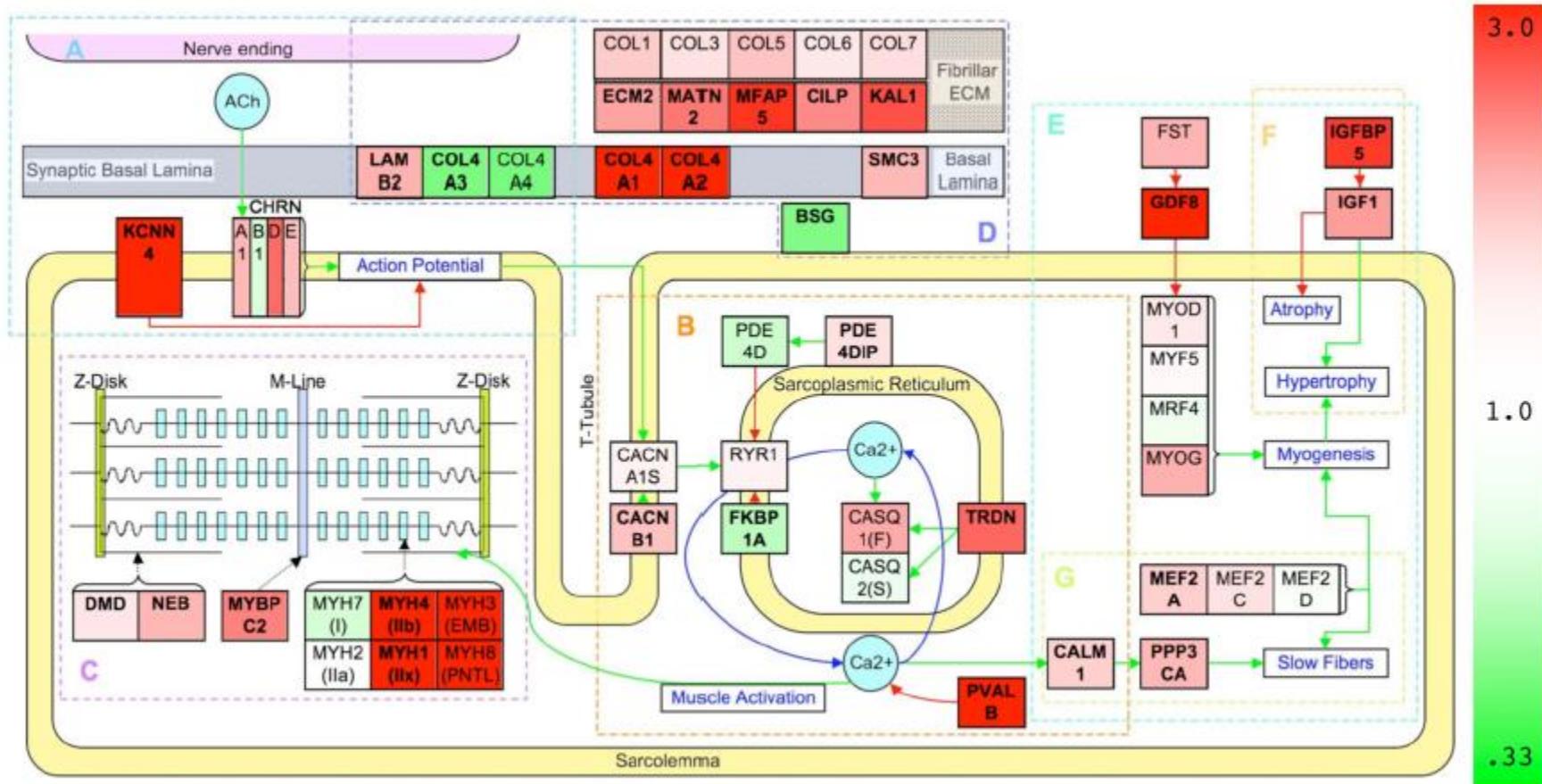
1. Passive egenskaber (sene, bindevæv etc)
2. Aktive egenskaber (hvor mange krydsbroer?)



Passive elastiske egenskaber



Hvad er det der er gået galt når muskler bliver stivere ?



Alterations in mRNA in muscle few hours after stroke or spinal cord injury – and changes in passive stiffness within days

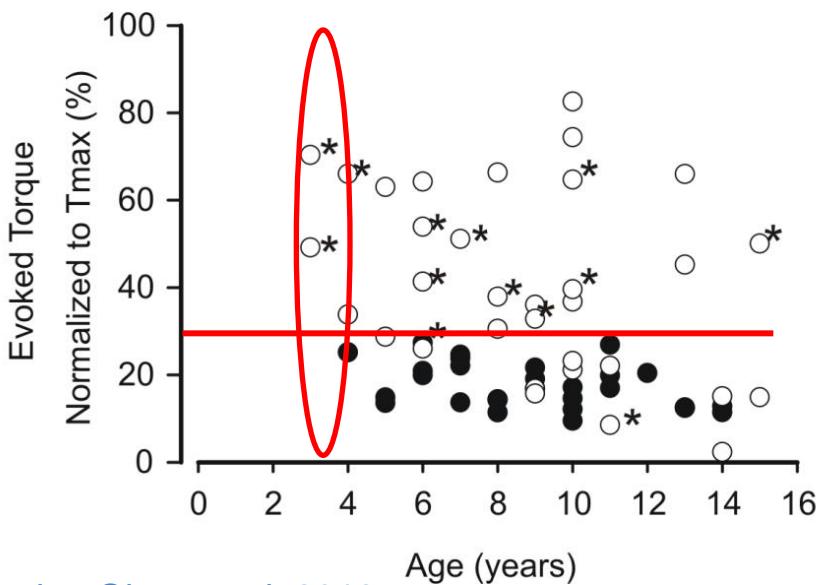
- Spasticity and contractures at the wrist after **stroke**: time course of development and their association with functional recovery of the upper limb. Malhotra S, Pandyan AD, Rosewilliam S, Roffe C, Hermens H. Clin Rehabil. 2011 Feb;25(2):184-91
- Non-reflex mediated changes in plantarflexor muscles early after **stroke**. Malouin F, Bonneau C, Pichard L, Corriveau D. Scand J Rehabil Med. 1997 Sep;29(3):147-53.
- Altered contractile properties of the gastrocnemius **muscle poststroke**. Gao F, Zhang LQ. J Appl Physiol (1985). 2008 Dec;105(6):1802-8.
- Relation between spasticity, weakness and contracture of the elbow flexors and upper limb activity after **stroke**: an observational study. Ada L, O'Dwyer N, O'Neill E. Disabil Rehabil. 2006 Jul 15-30;28(13-14):891-7.
- Alterations in mRNA **expression** and protein products following **spinal cord injury in humans**. Urso ML, Chen YW, Scrimgeour AG, Lee PC, Lee KF, Clarkson PM. J Physiol. 2007 Mar 15;579(Pt 3):877-92.

Passiv stivhed er forøget hos de fleste børn med CP Reflex stivhed kun hos ganske få

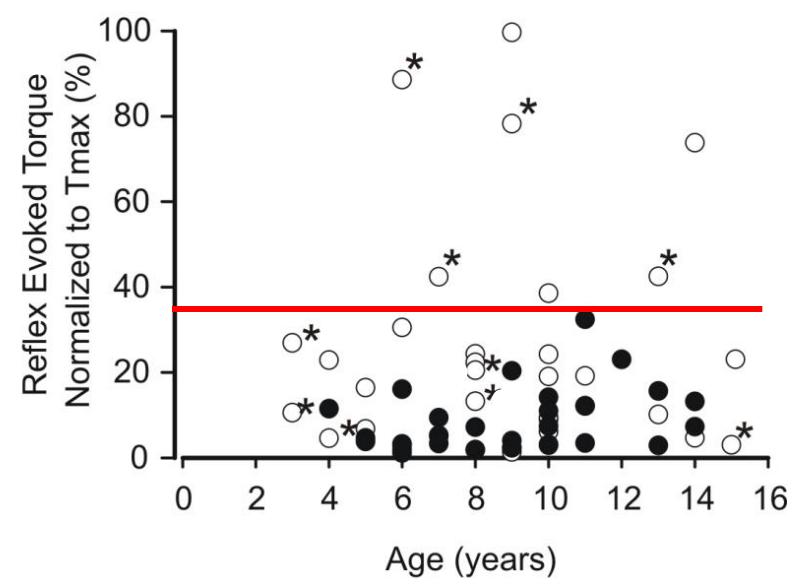


Maria
Willerslev-Olsen

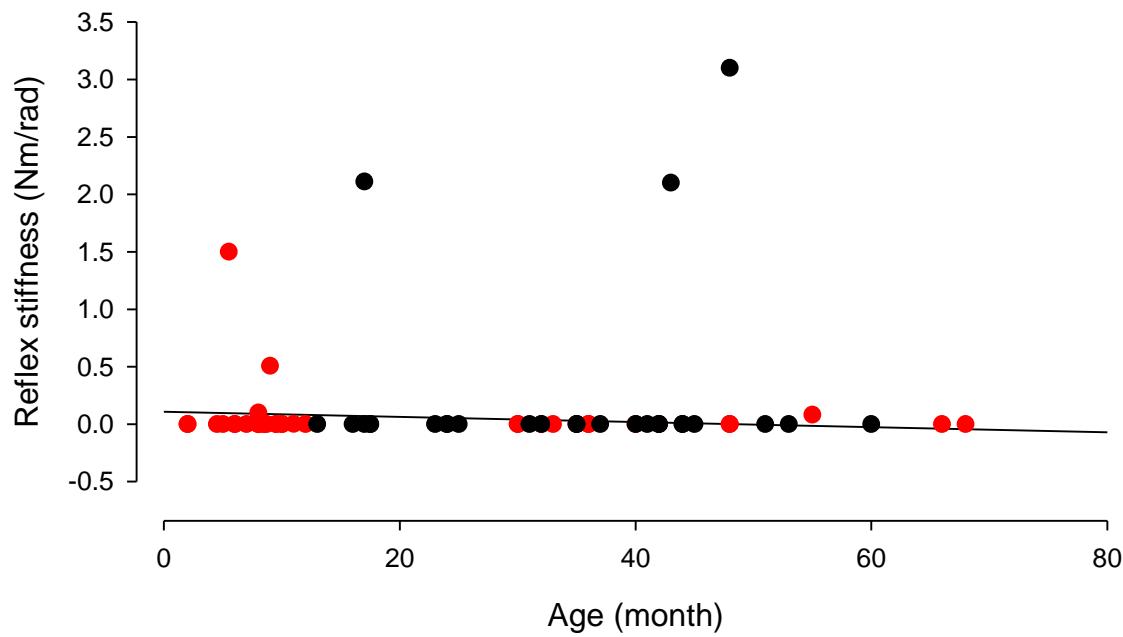
Passive Stiffness vs Age



Reflex Stiffness vs Age



Spasticitet er heller ikke betydningsfuld hos spædbørn med CP



Er spasticitet ansvarlig for udviklingen af kontrakturer?

Thus, the results suggest that BoNT-A can be effective in reducing muscle tone over a longer period, but not in preventing development of contractures in spastic muscles. The dissociation between the effects on muscle tone and ROM indicates that development of contractures is not coupled to increased muscle tone only, but might be caused by other mechanisms.

Long-term effects of botulinum toxin A in children with cerebral palsy.

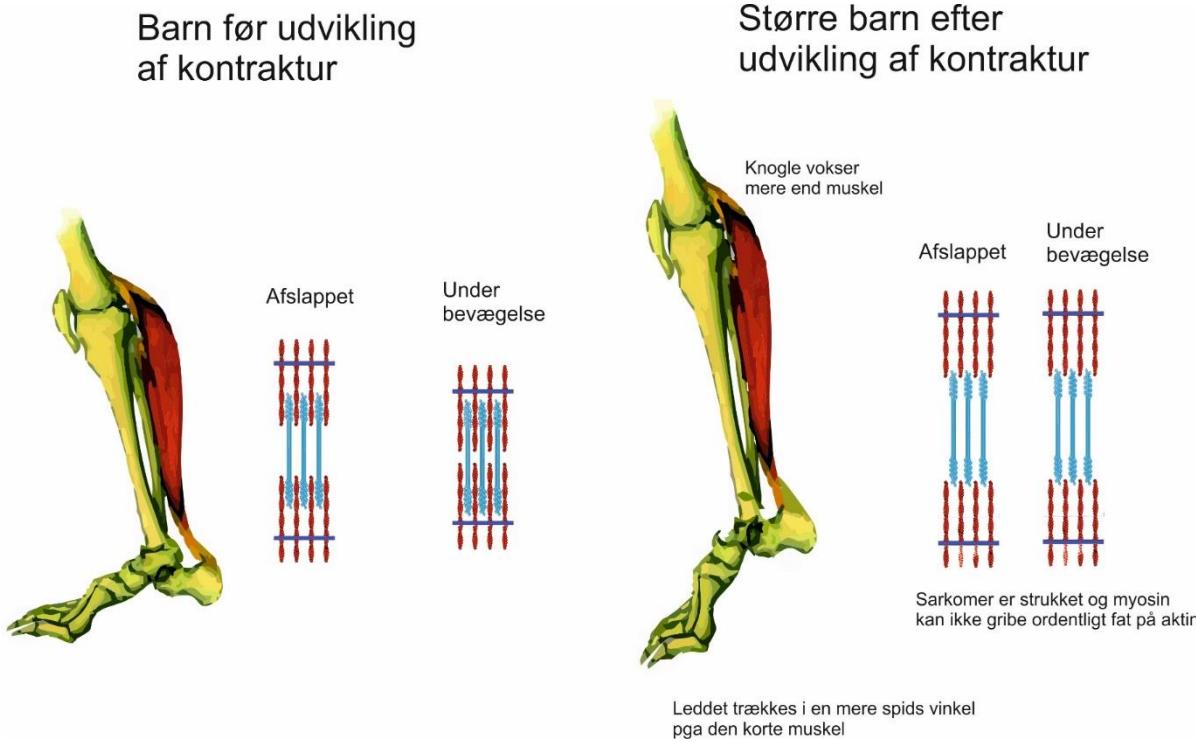
Dev Med Child Neurol. 2009 Feb;51(2):120-7.

The spasticity-reducing effect of SDR, although pronounced, did not seem to improve long-term functioning or prevent contractures. This suggests that contracture development in CP is not mediated by spasticity alone.

Does loss of spasticity matter? A 10-year follow-up after selective dorsal rhizotomy in cerebral palsy

Dev Med Child Neurol. 2011 Aug;53(8):724-9

Manglende vækst af muskel spiller central rolle ved udvikling af kontrakturer hos børn med CP



Udviklingen af muskelstivhed hos børn med CP



Maria Willerslev-Olsen



Josefine Michelsen



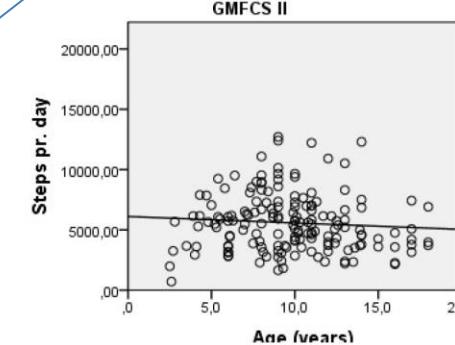
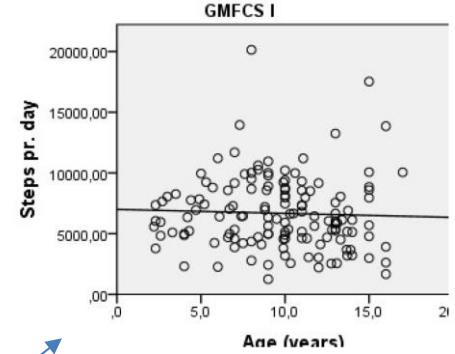
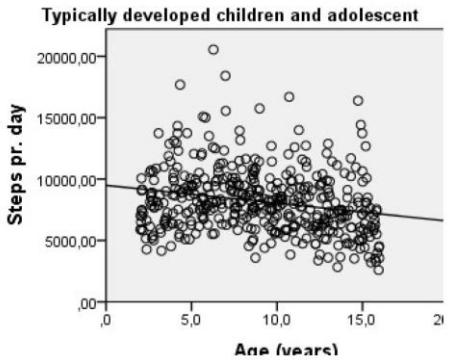
Gitte Normann Jørgensen



Mai Choe Lund

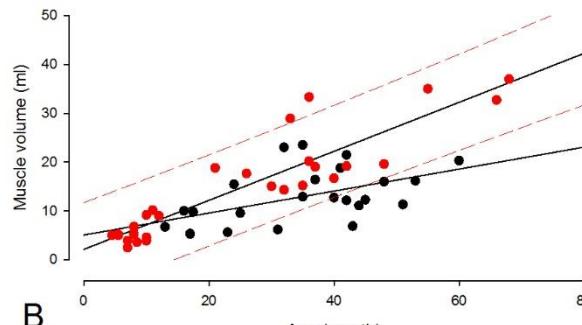


Daglig fysisk aktivitet

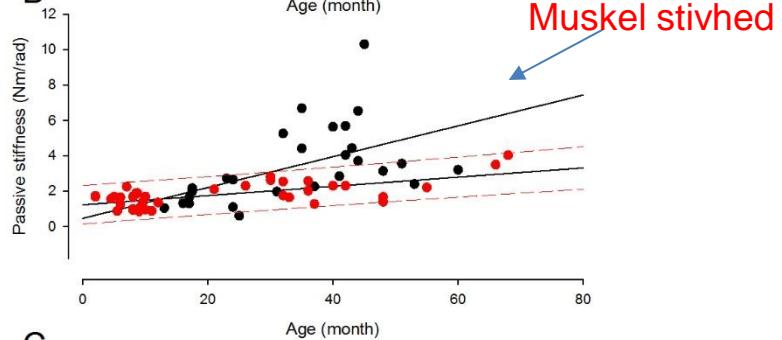


Muskel volumen

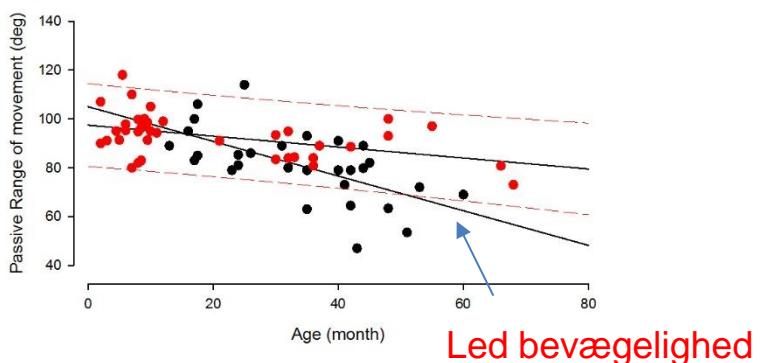
A



B



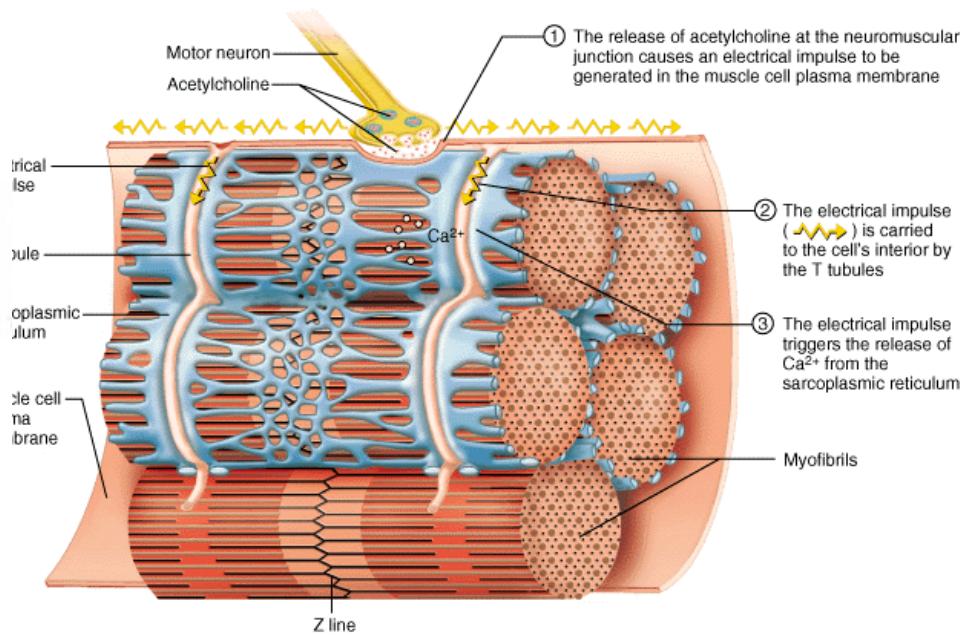
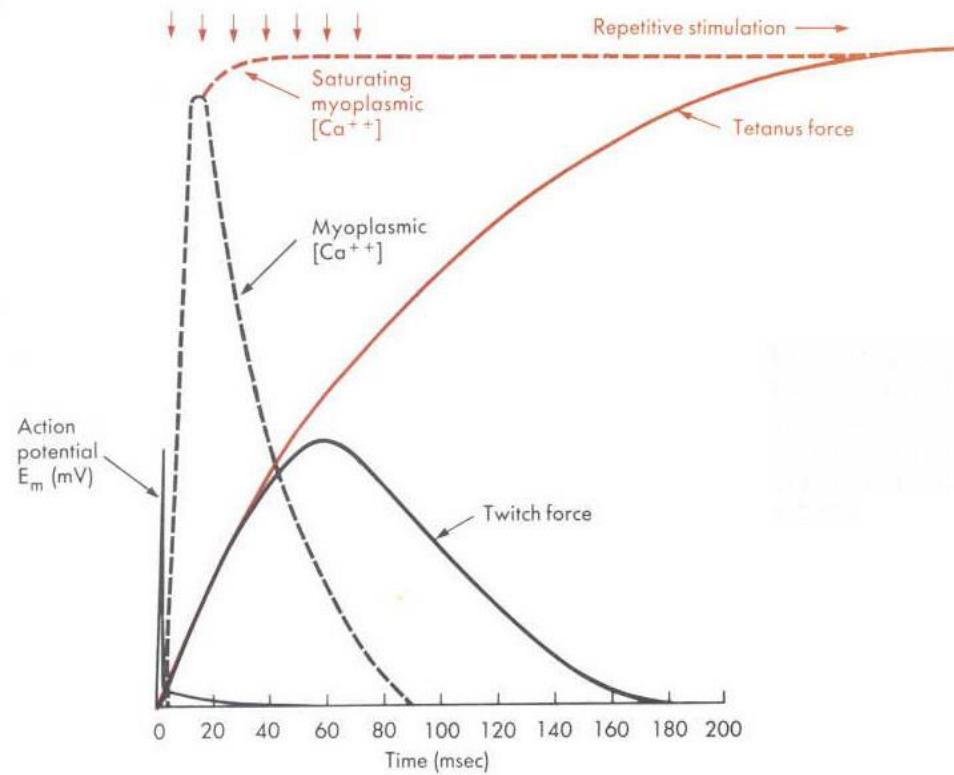
C



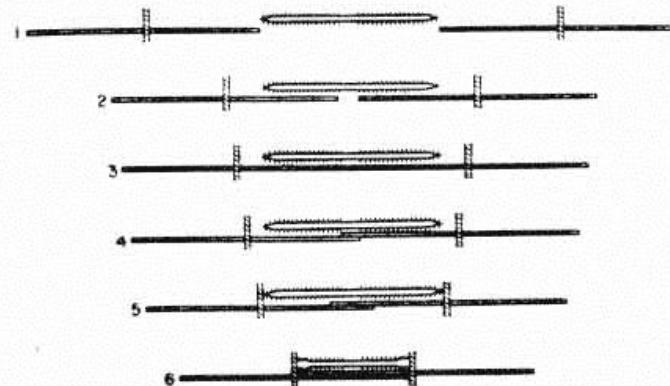
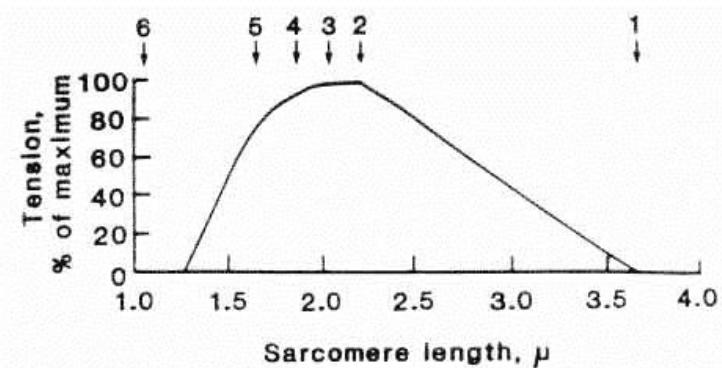
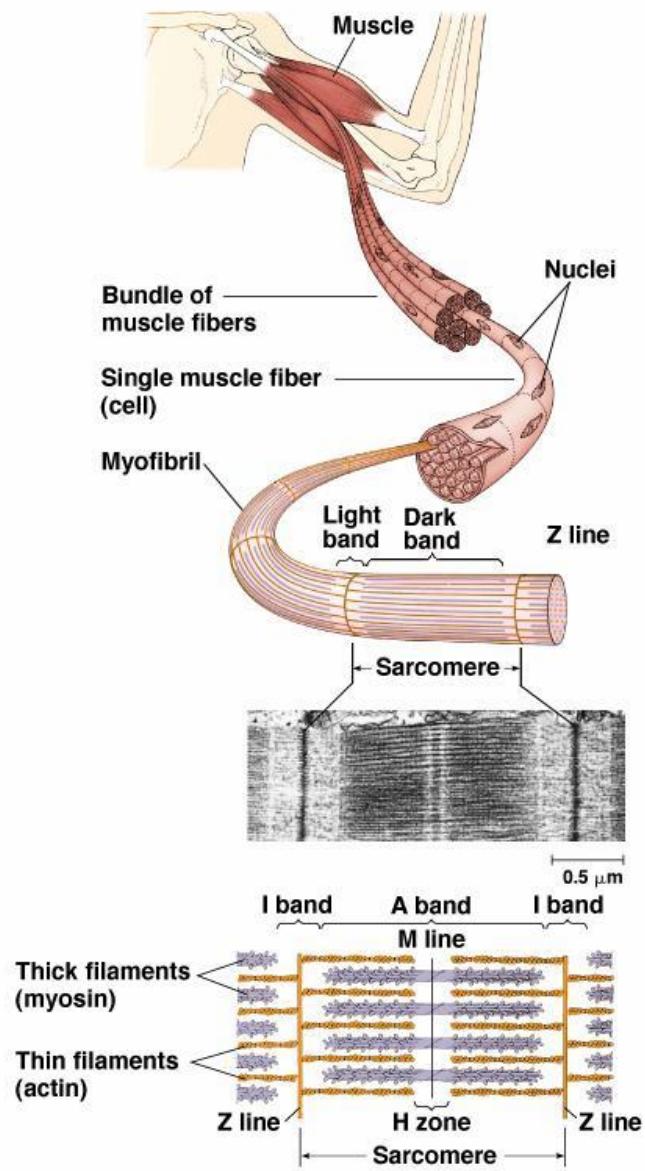
Muskel stivhed

Led bevægelighed

Elektromekanisk kobling



Cross-bridge formation

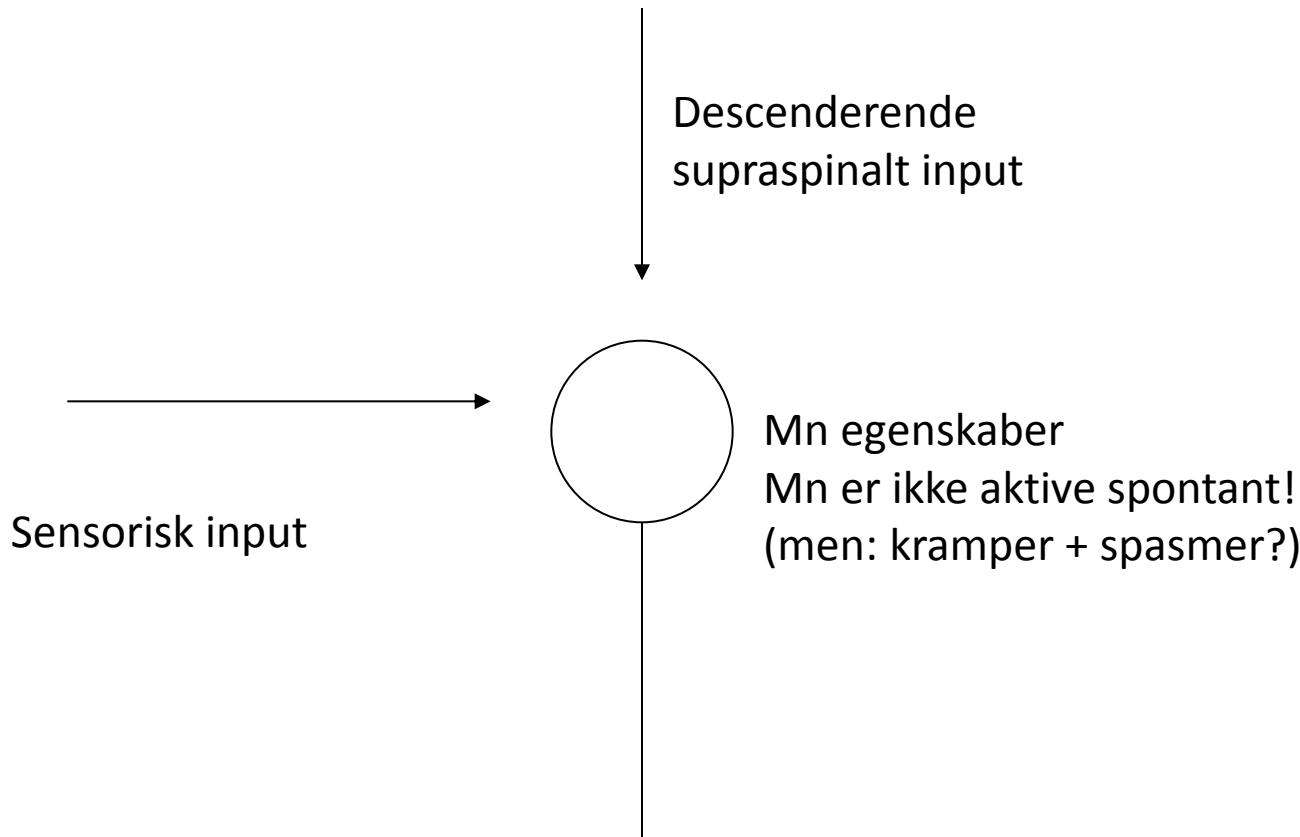


- Hvis der ikke findes aktivitet i nererne (ingen AP) er der heller ikke ret meget Ca i muskelcellerne og derfor ingen dannelse af krydsbroer – **dødsstivhed bidrager med andre ord ikke til musklernes stivhed (tonus) i hvile** – dvs udelukkende bindevæv o.a. bestemmer stivheden i hvile

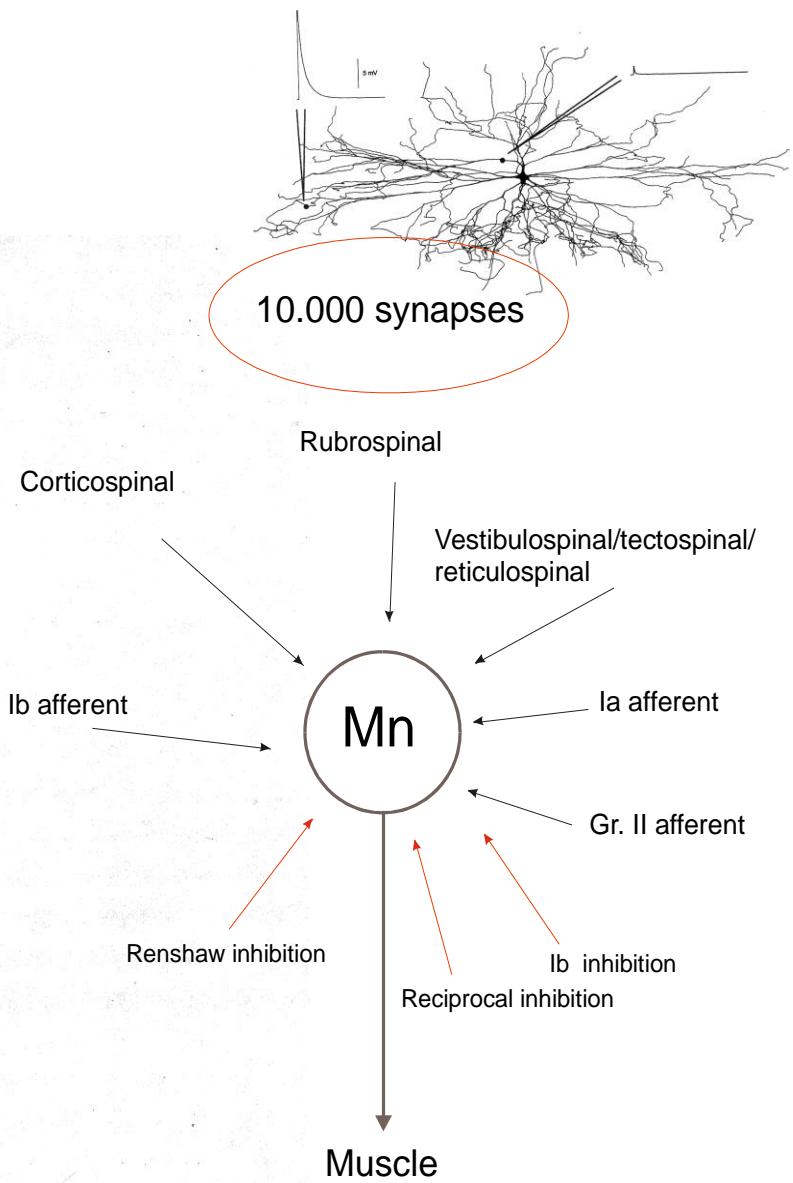
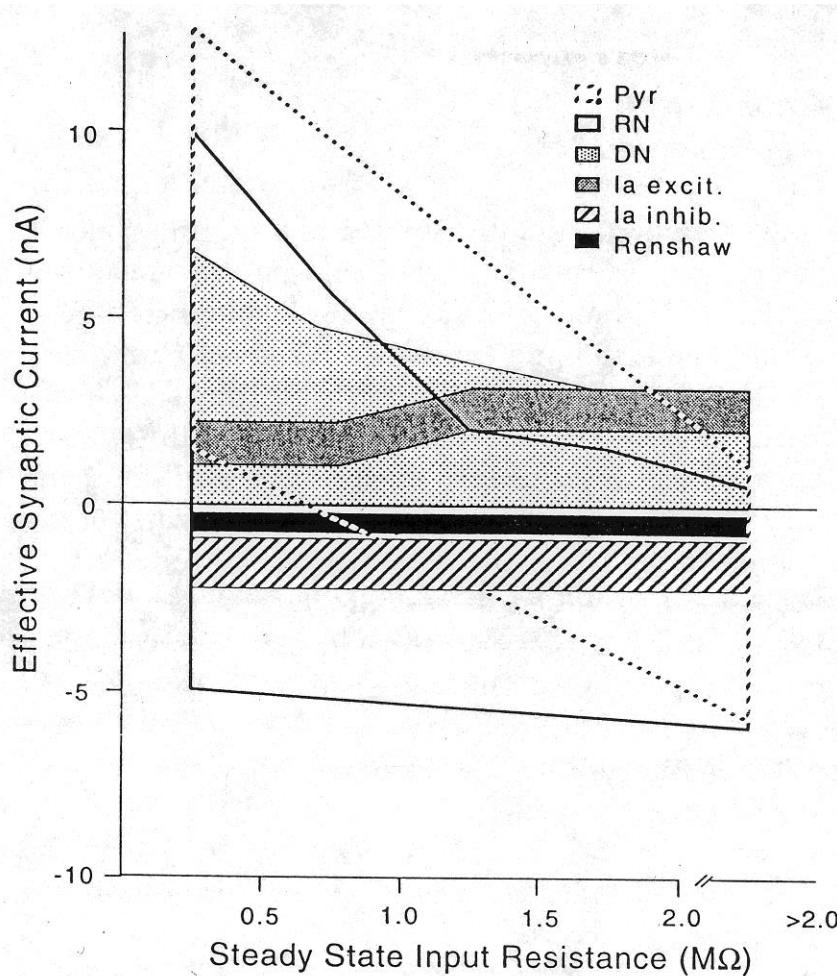
pause

- NB: Motoneuronerne er pr definition langt fra deres fyringstærskel i hvilesituationen – og sender således ingen aktionspotentialer til musklerne. Men er vi i den kliniske situation altid sikre på at patienten er i hvile? Findes der forskellige grader af hvile?
- Hvad har betydning for det?
- Hvad er 'ufrivillig' muskelaktivitet – og hvor kommer det fra

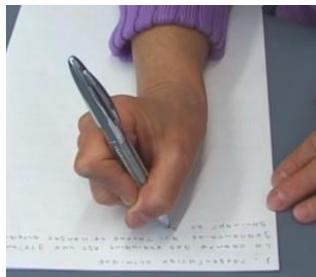
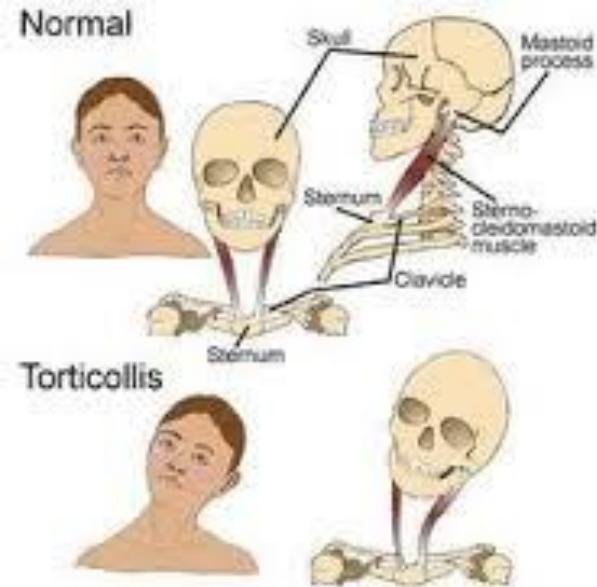
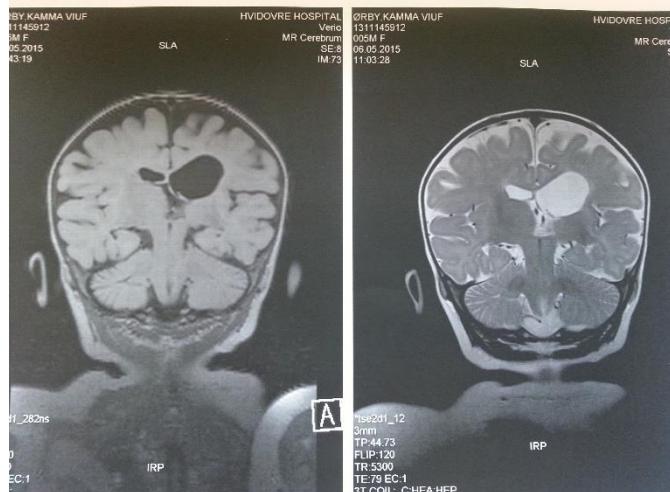
Hvad bestemmer aktiviteten i motorneuroner? Den forenklede model.



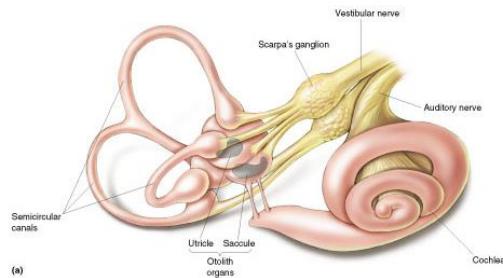
Hvad bestemmer aktiviteten i motorneuroner?



Spastisk dystoni – involuntær muskelaktivitet pga basal ganglie påvirkning?

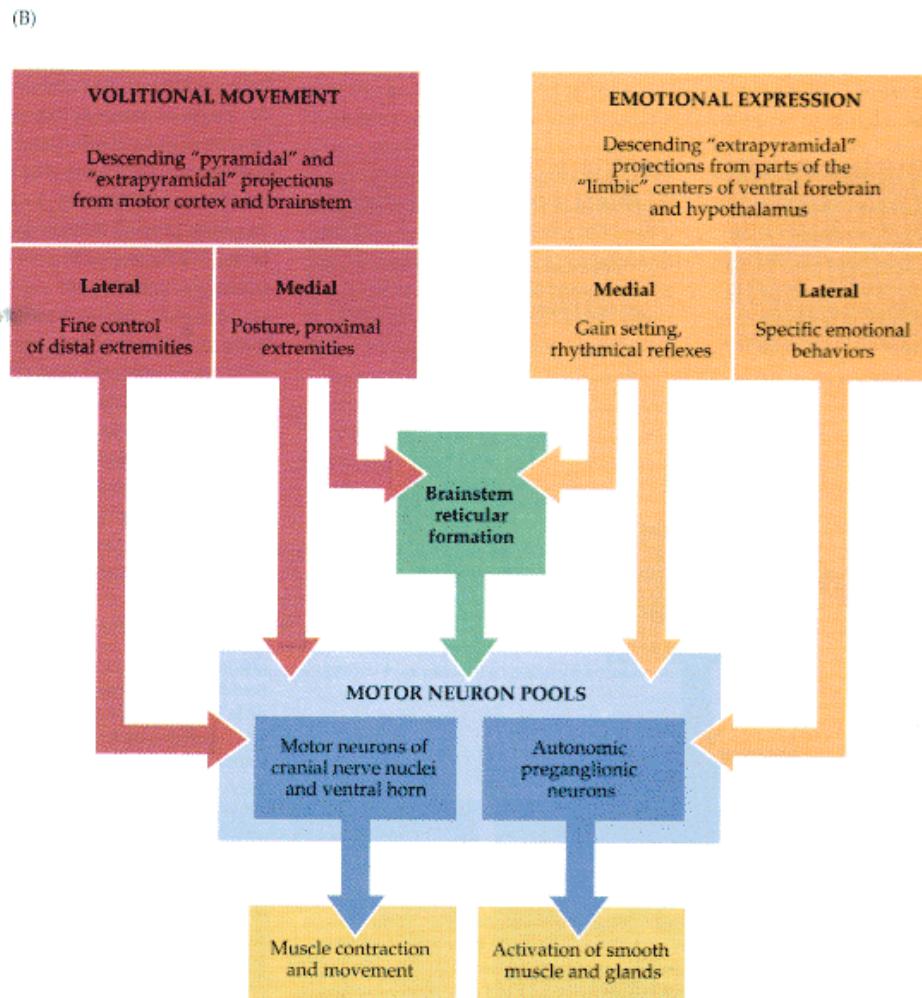
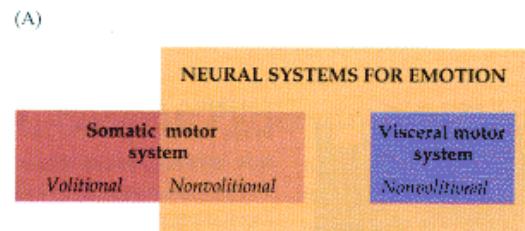


Balanceorganet og nakkereflekser arbejder sammen om at sikre opretstående stilling



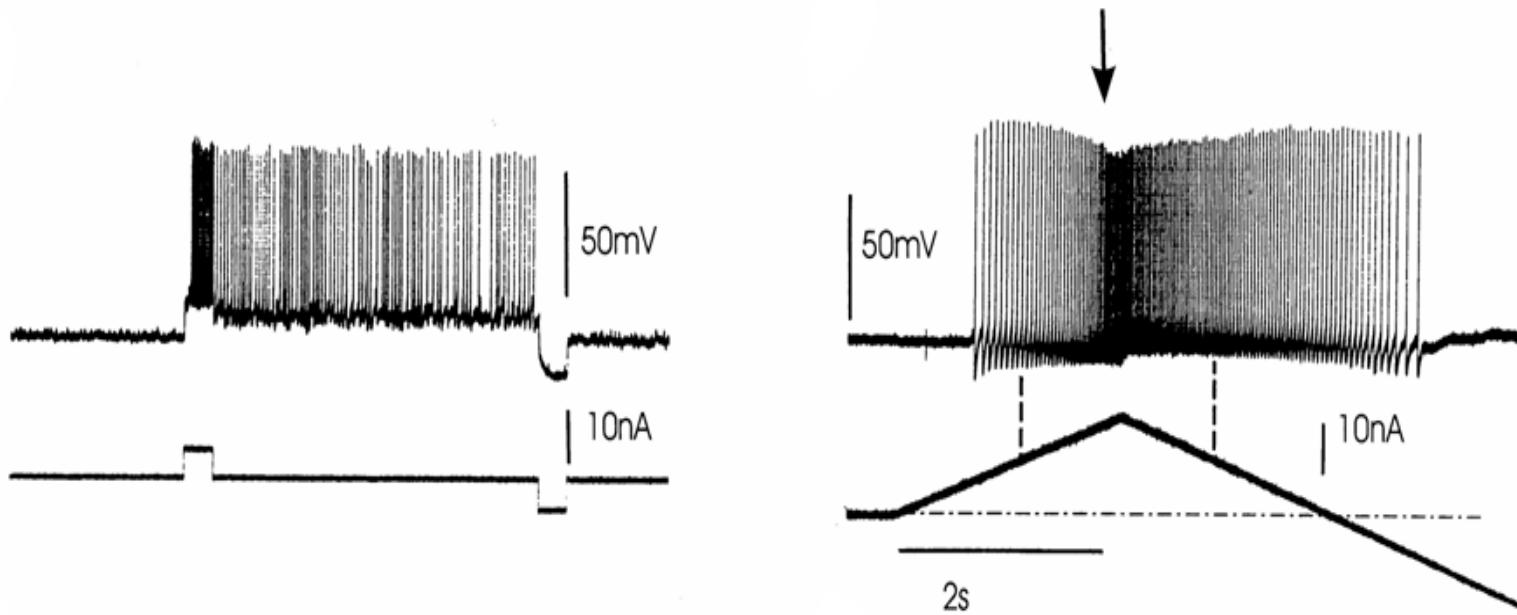
NAKKE	LABYRINT		
	HOVED OP	HOVED LIGE FREM	HOVED NED
DORSAL - FLEKTERET	(a)	(b)	(c)
NORMAL	(d)	(e)	(f)
VENTRAL - FLEKTERET	(g)	(h)	(i)

The two systems for control of movement. Emotional and voluntary



I couldn't help smiling

Motoneuronal properties – sustained (involuntary activity)



- Budskabet er at der ikke er øget stivhed i musklerne medmindre der er forandringer i musklernes bindebæv o lign (kontrakturer og forstadier) eller aktivitet i motorneuronerne. Aktiviteten i motorneuronerne kan være 'spontan' - slapper patienten af? – er der tale om dystoni? – eller provokeret af descenderende aktivitet eller sensorisk input (spasticitet)

Klassifikation:

Passiv

