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NeuroFlexor – objective measurement of spasticity

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Disclaimer

Johan Gäverth owns parts of the commercial rights of the NeuroFlexor, as shareholder in Aggero MedTech AB

www.aggeromedtech.com

The NeuroFlexor is

- an objective and specific measure of **spasticity**
- an objective measure of **muscle stiffness/ elasticity**
- CE-approved. For both clinical and research purposes

How does the NeuroFlexor work?

Measures resistance to passive movement (SLOW and FAST)

A biomechanical algorithm separates the resistance into three components:

NEURAL – SPASTICITY
ELASTIC
VISCOUS

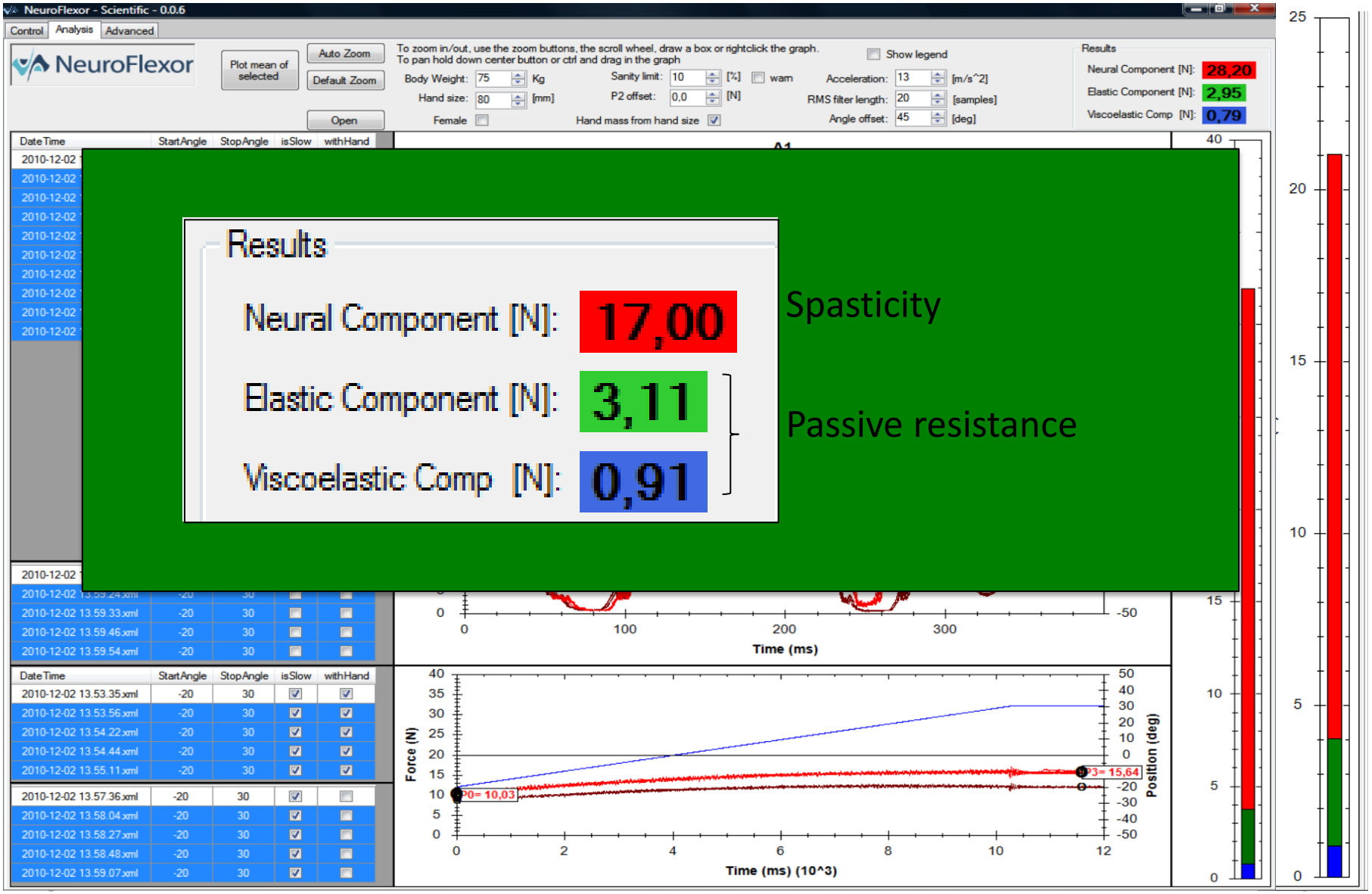
Biomechanical algorithm

$$F_m = F_{in} + F_v + F_p + F_r$$

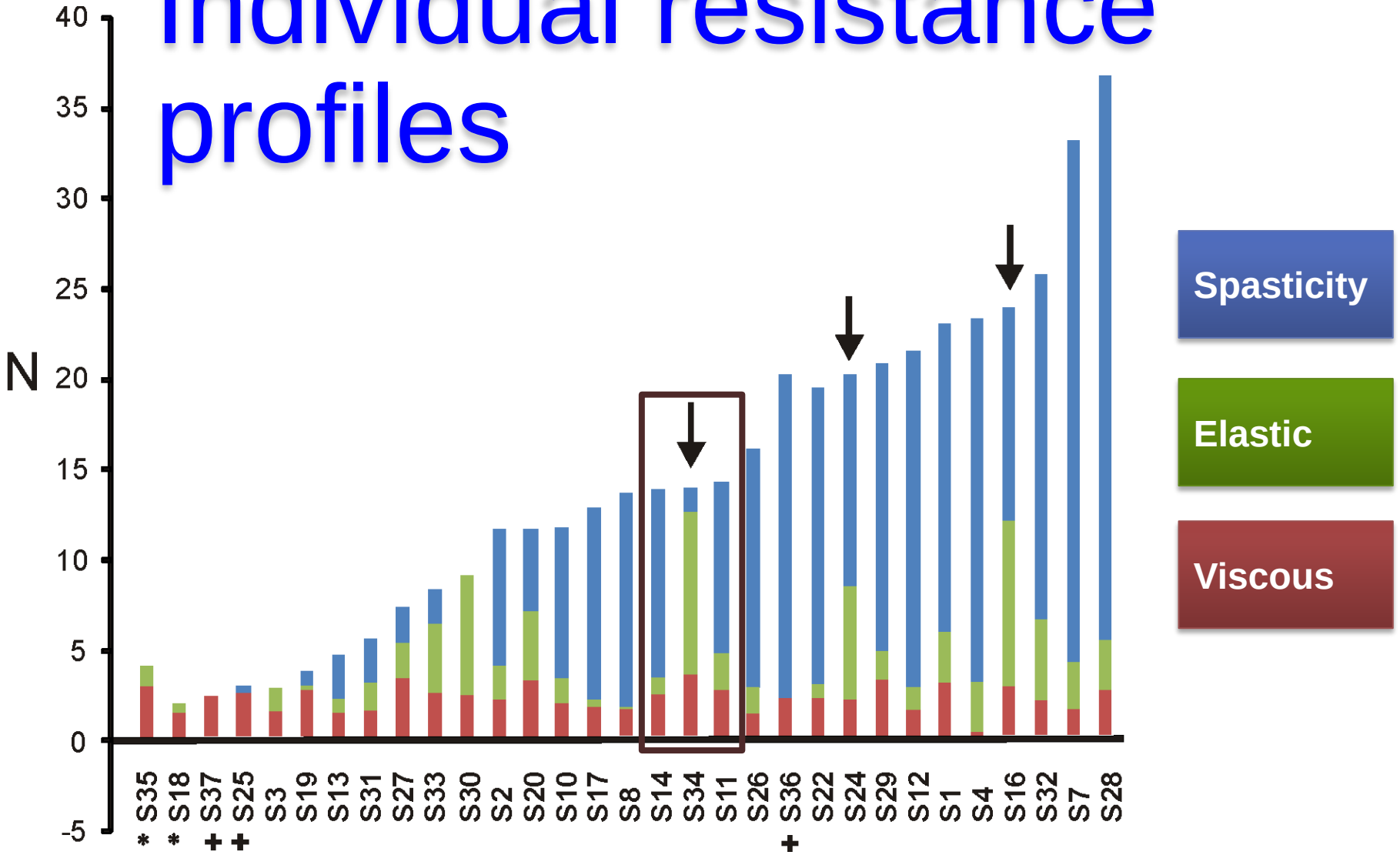
During passive movement the resisting force (F_m) is the sum of several components

+ Inertia	F_{in}
+ Viscosity	F_v
+ Elasticity	F_p
+ Neural resistance (Spasticity)	F_r
= Total resistance	$\mathbf{F_m}$

Output

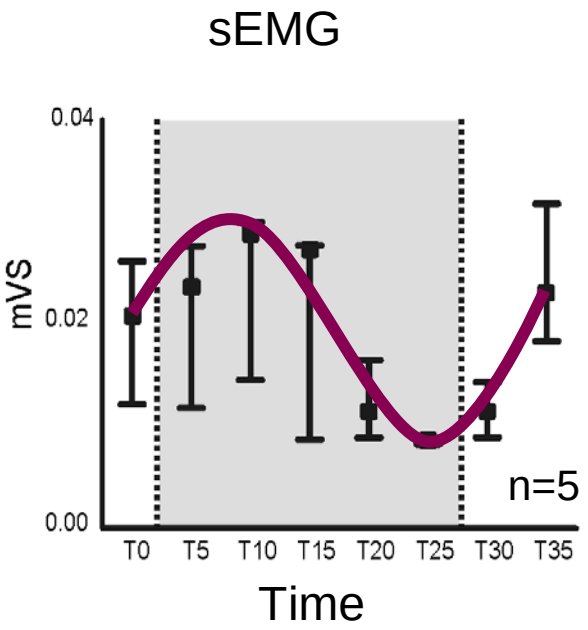

NeuroFlexor - Scientific - 0.0.6
Control
Analysis
Advanced
NeuroFlexor
Plot mean of selected
Auto Zoom
Default Zoom
Open
To zoom in/out, use the zoom buttons, the scroll wheel, draw a box or rightclick the graph.
To pan hold down center button or ctrl and drag in the graph
Body Weight: 75 Kg
Hand size: 80 [mm]
Female
Sanity limit: 10 [%]
P2 offset: 0,0 [N]
Hand mass from hand size
wam
Show legend
Acceleration: 13 [m/s^2]
RMS filter length: 20 [samples]
Angle offset: 45 [deg]
Results
Neural Component [N]: 28,20
Elastic Component [N]: 2,95
Viscoelastic Comp [N]: 0,79
DateTime
StartAngle
StopAngle
isSlow
withHand
Results
Neural Component [N]: 17,00
Elastic Component [N]: 3,11
Viscoelastic Comp [N]: 0,91
Spasticity
Passive resistance
Time (ms)
Force (N)
Position (deg)
P0= 10,03
P3= 15,64
Time (ms) (10^3)

Individual resistance profiles



The method can identify individuals who will not benefit from treatment with botulinum toxin

Evidence of validity
Ischemic nerve block test



Elastic and Viscous components unchanged during the nerve block

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Validation of a new biomechanical model to measure muscle tone in spastic muscles.

Lindberg PG, **Gäverth J**, Islam M, Fagergren A, Borg J, Forssberg H. *Neurorehabil Neural Repair* 2011; 25: 617–625.

High test-retest and interrater reliability

$ICC_{2.1}$	Test-retest	Interrater
NC	0.90	0.90
EC	0.79	0.76
VC	0.88	0.75

The Smallest Real Difference can be calculated on an individual level to evaluate effects of treatment.

Larger variations between tests in persons with severe spasticity

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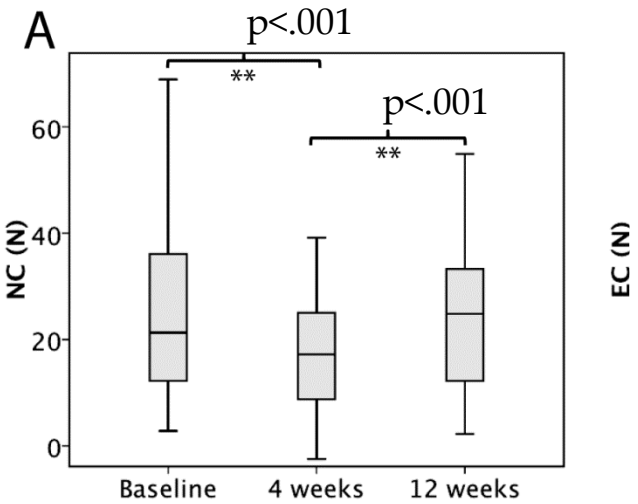
Test-retest and inter-rater reliability of a method to measure wrist and finger spasticity.

Gäverth J, Sandgren M, Lindberg PG, Forssberg H, Eliasson A-C.

J Rehabil Med 2013;45:630-636.

Sensitivity to change



Neural component

Sensitivity of the NeuroFlexor method to measure change in spasticity after treatment with botulinum toxin A in wrist and finger muscles.

Gäverth J, Eliasson A-C, Kullander K, Borg J, Lindberg PG, Forssberg H.

J Rehabil Med 2014;46:629-634

Future R&D

- Foot module
- Validation for children with cerebral palsy
- Exploration of the association between spasticity and functioning
- Increased functionality
  - Range of Movement
  - Muscle strength
  - Selective motor control
  - Joint position sense
- Normative data

Thank you!

Please visit www.aggeromedtech.com for complete list of publications.

NeuroFlexor

Measure spasticity accurately