

S FEMG.Info

## Jitter recordings with concentric needle electrode

Erik Stålberg

Most of the voluntary signals are recorded by Stålberg  
All stimulation signals are recorded by Kouyoumdjian (shown with permission)

Classical Single fiber EMG, for jitter analysis

### CNEMG signal from 2-15 muscle fibres

Stålberg

### SFEMG (Single Fibre EMG) signal from 1 muscle fibre

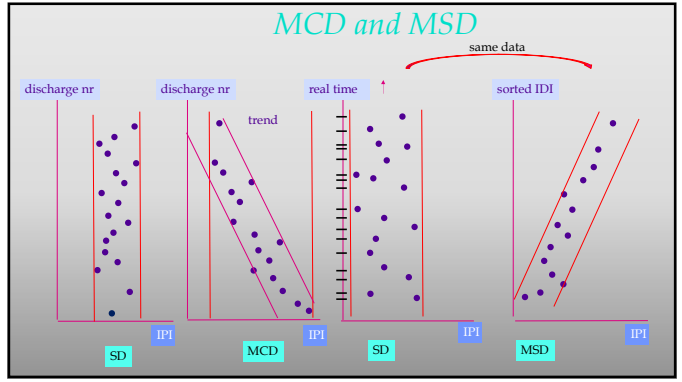
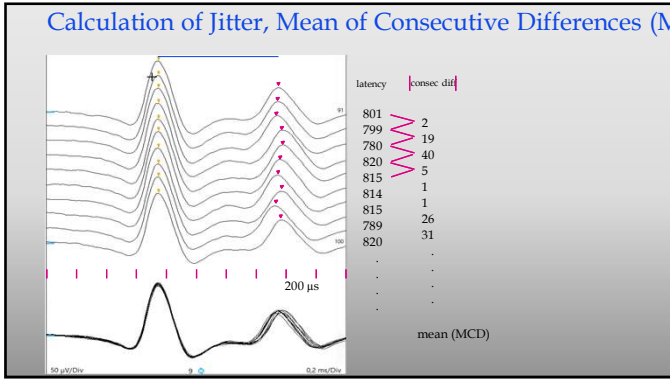
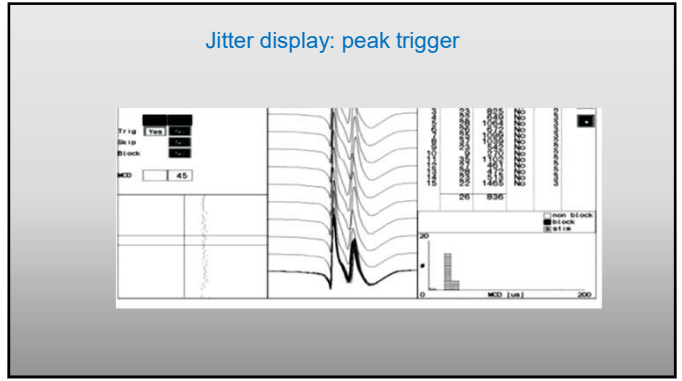
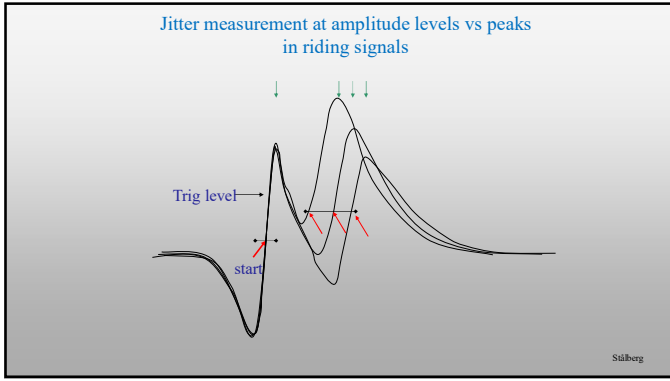
Stålberg

### SFEMG; jitter

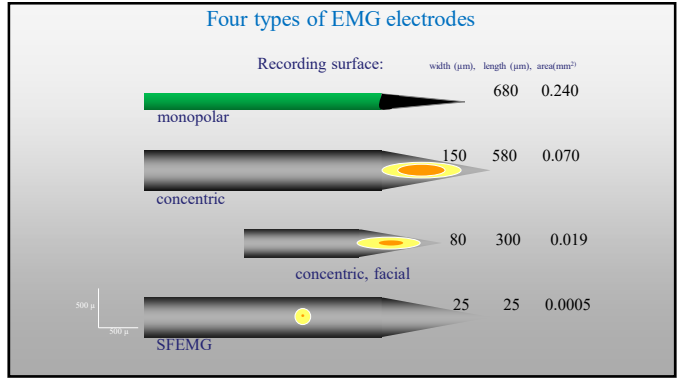
Stålberg

### Single fiber action potentials in MG volitional activation

Stålberg



### Measuring jitter with Concentric Needle electrodes

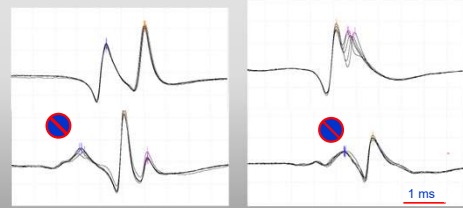


### Definitions of acceptable CNE signals for jitter analysis

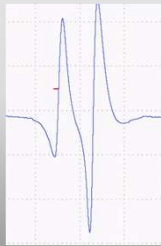
- Positive-negative signals without inflections, notches or shoulders.
- Parallel rising segments upon superimposition (5-15)
- Negative peaks should be separated by more than 150 usec
- Allow only slight amplitude variation in the signal, else summation from same MU or background activity
- Amplitude > 50uV

### Jitter recordings with Conc el.

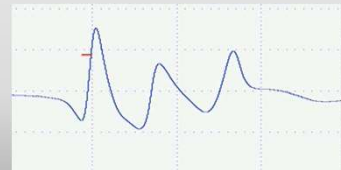
Facial needle, 1000Hz-10KHz



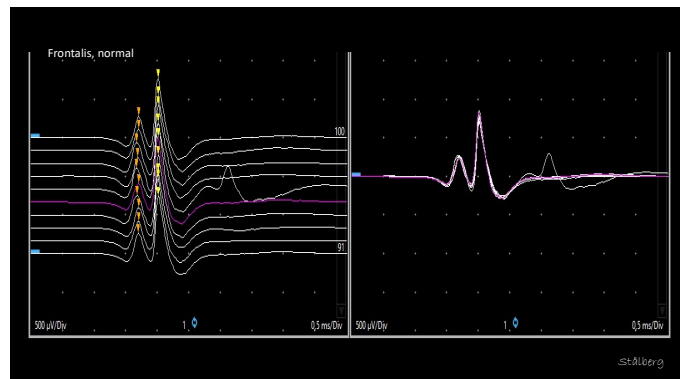
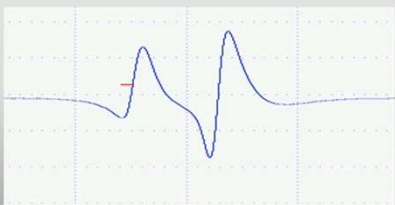
### SFEMG

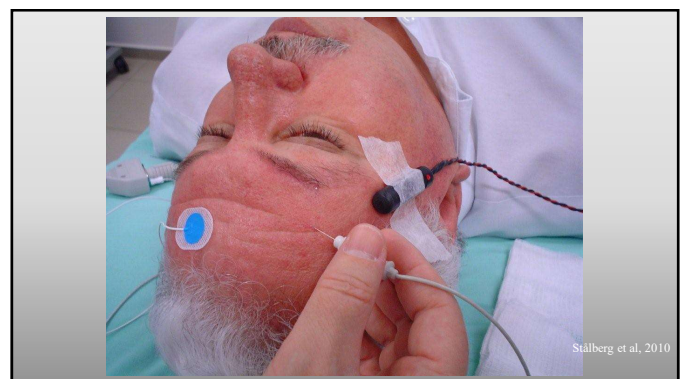
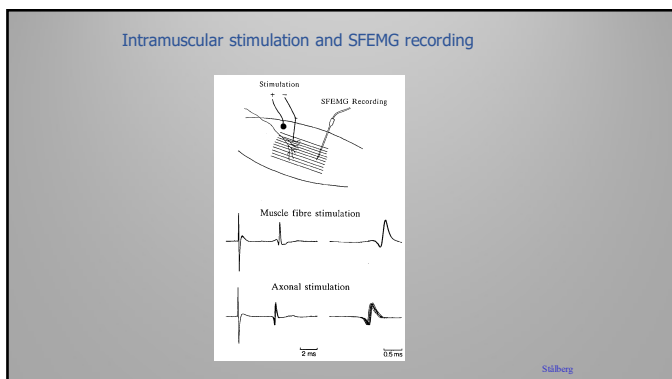
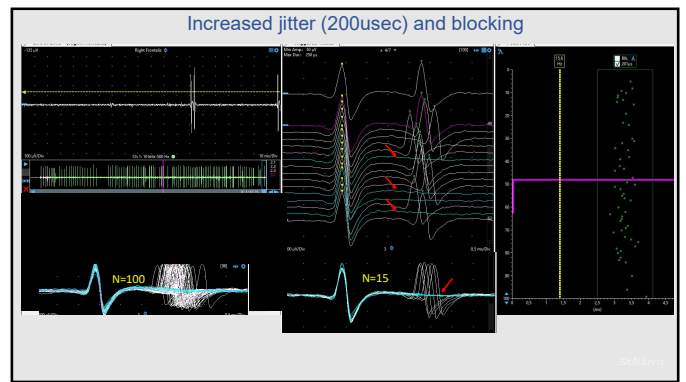
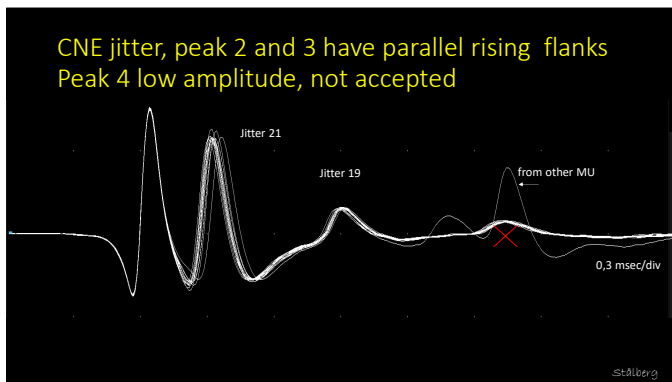
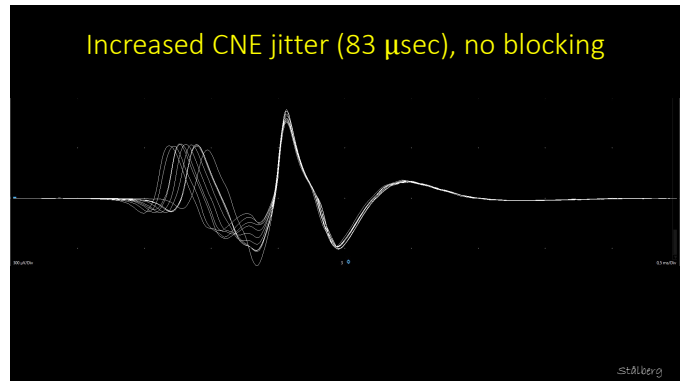
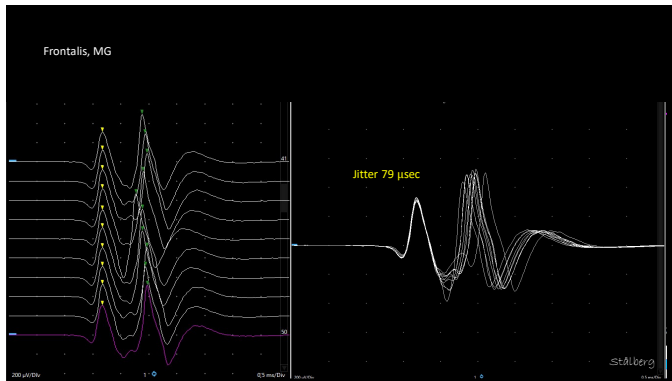


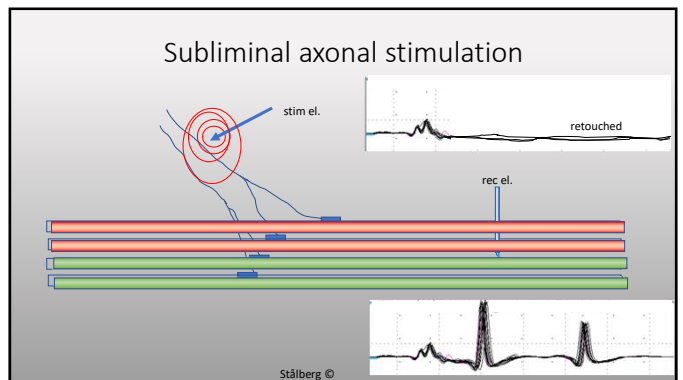
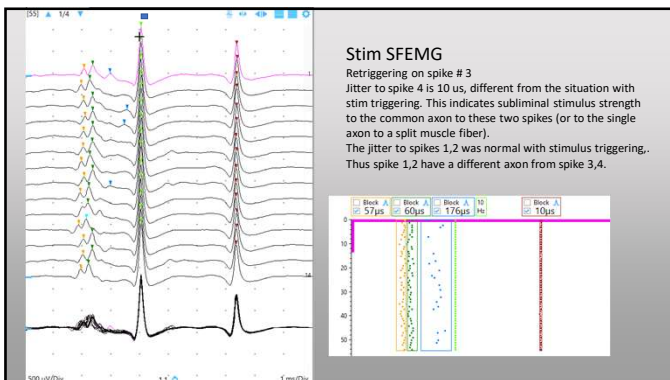
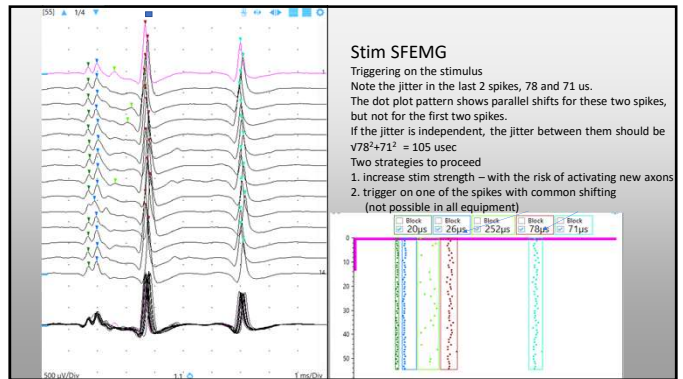
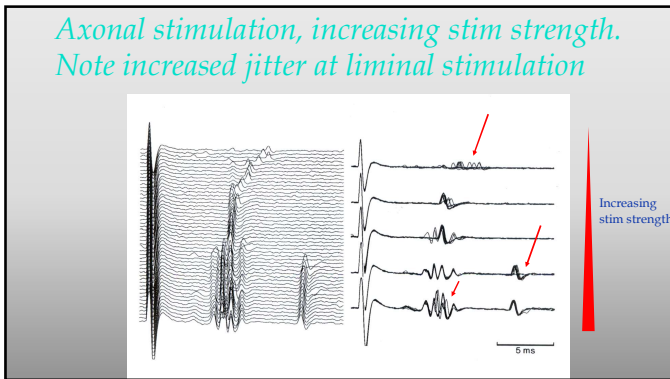
### Jitter with conc needle electrode



### Jitter with conc needle electrode acceptable

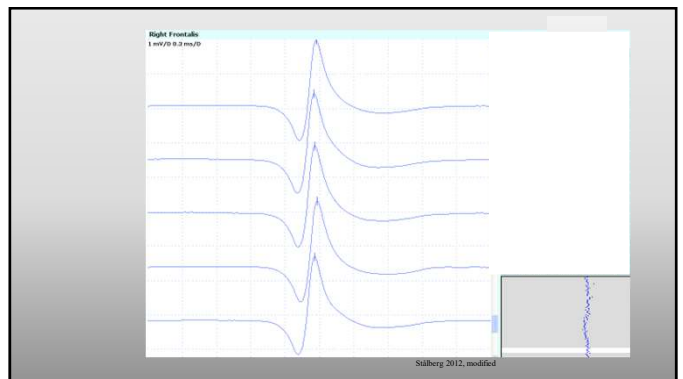


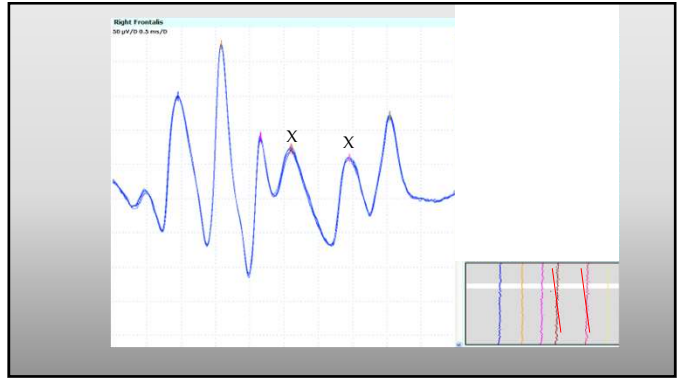
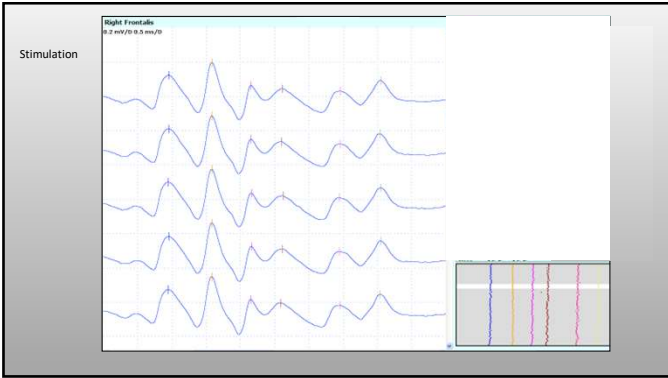
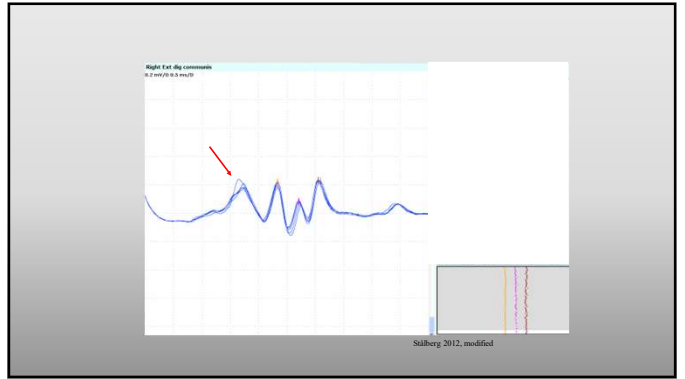
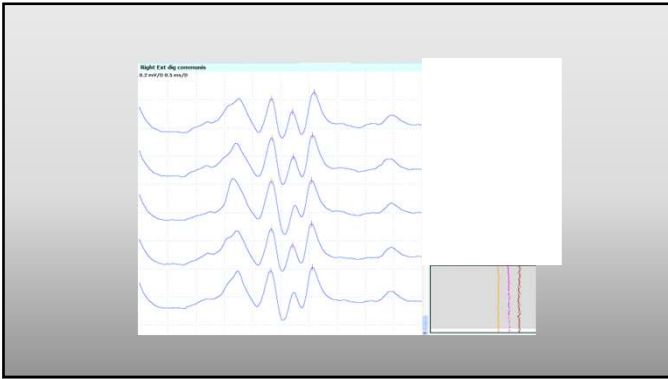
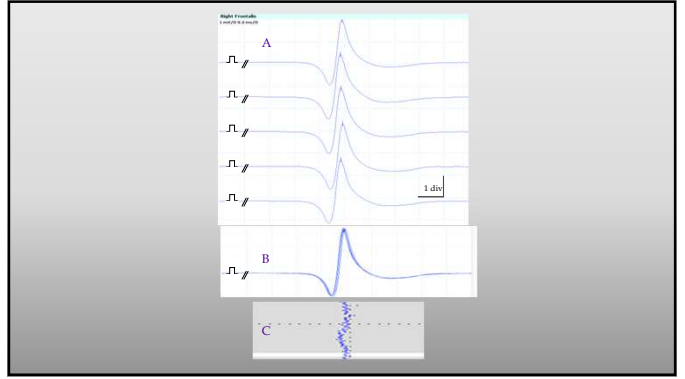


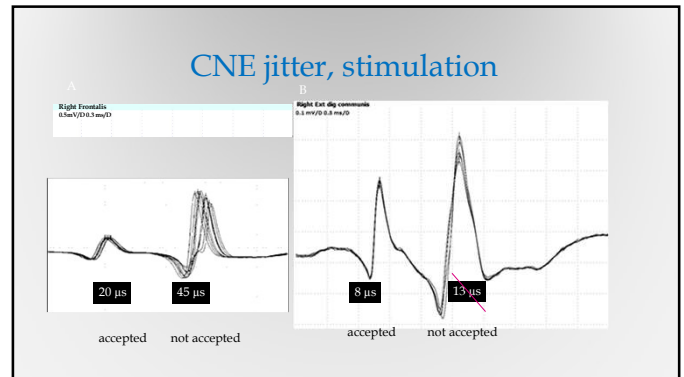
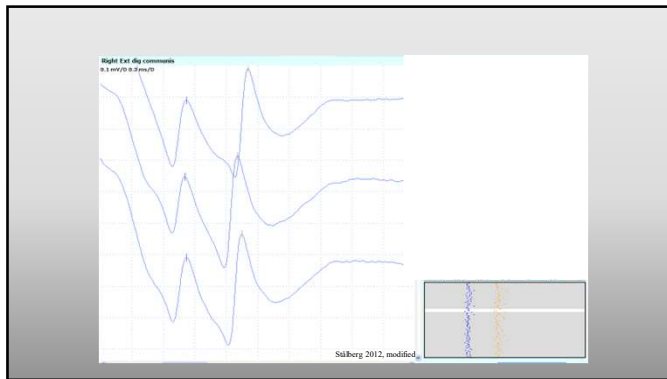


*The recording; practical hints*

**ELECTRICAL STIMULATION**  
 Needle or surface electrode for stimulation, 5-10Hz  
 Insert the CNE into twitching muscle part  
 Use slight stimulus intensity, to get few spikes  
 Make sure that the spike of interest, is supraliminally stimulated  
 If a spike shows abnormal jitter, increase the stim. intensity a little  
 Measure jitter between stimulus and spike/s in focus







### Jitter with CNE

Muscle	Mean MCD	Individual data
	limit μs	limit μs
OO vol	31	45
OO stim	27	36
Frontalis vol	28	38
Frontalis stim	21	28
Ext dig vol	30	43
Ext dig stim	24	35

Stålberg et al. Multicenter study, 2015

### NOTE

Increased jitter or abnormally decrementing response on RNS are not equal to MG but usually a sign of disturbed nm transmission (as in reinnervation)

### Amplifier settings:

**Filter:** CNE for jitter analysis      1kHz-10kHz

**Sweep speed:** 0,5 msec/div (always less than 2 msec/div)

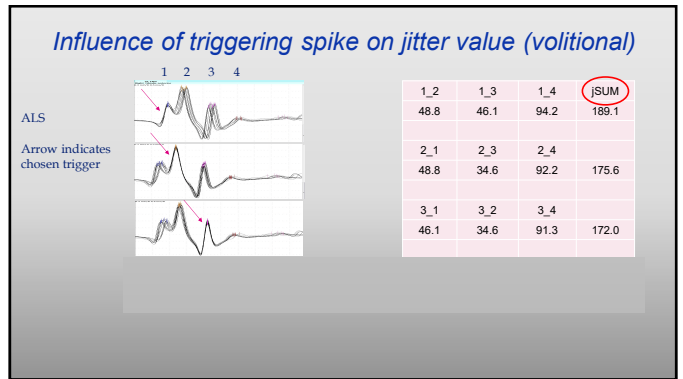
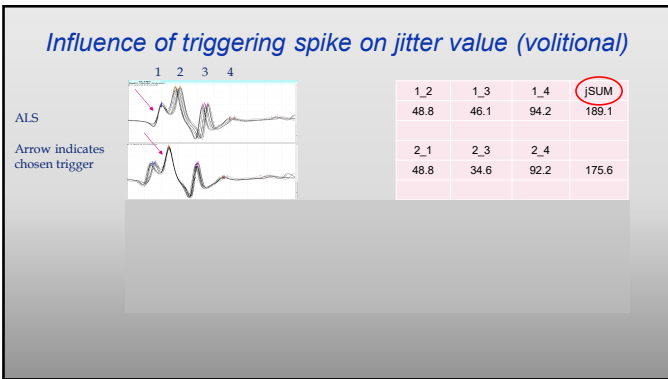
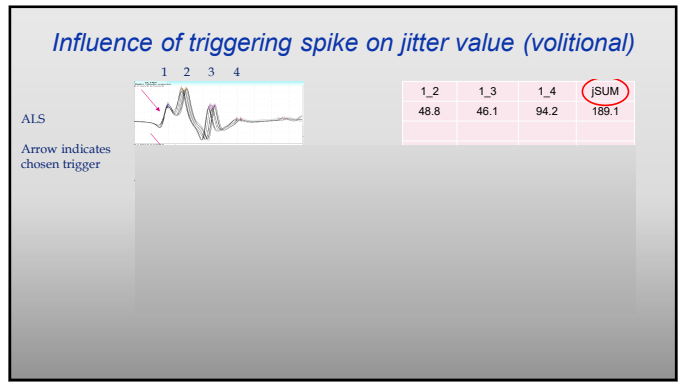
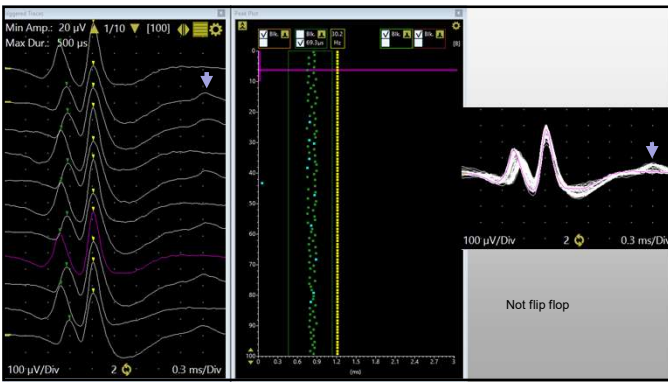
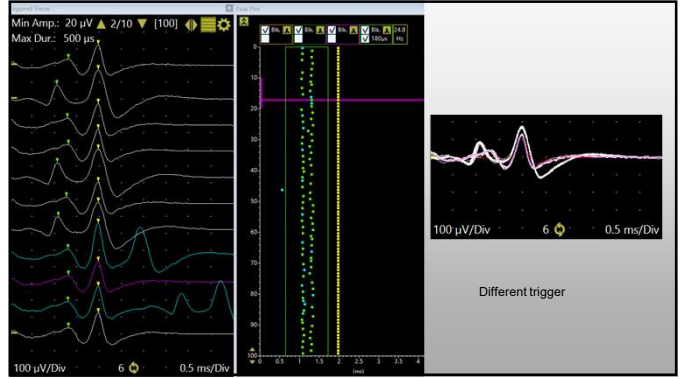
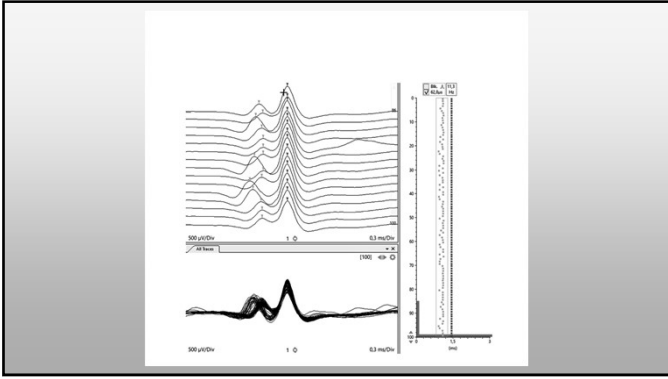
**Gain:** not crucial. Make signals to cover about 2 divisions

For quality control during and after recording, superimpose 5-15 sweeps

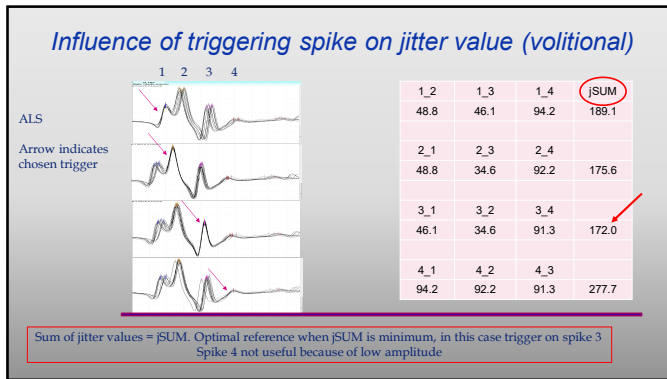
### Some additional aspects on CNE jitter

**Voluntary activation:**  
mis-triggering, false blocking

**Stimulation:**  
effect of activation pause, VRF

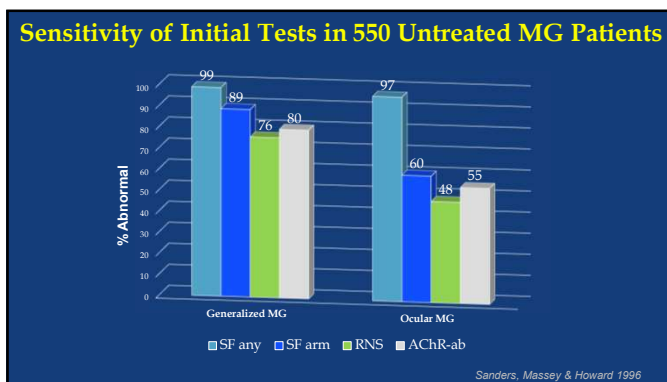






### Sensitivity

The degree of increased jitter in the diagnosis of MG is similar for the SFEMG and CNE methods



### Frequently asked questions

Q: Can we measure FD with CNE?  
A: no, too large uptake area, go for MUP parameters

Q: Which muscles to use in MG diagnosis?  
A: symptomatic muscles. Often orb oculi and frontalis

Q: what about Botox  
A: Remote effects cause jitter in many muscles. Effect remains for long time; 3-6 months

Q: if jitter is normal in OO with ptosis which is the interpretation  
A: Ptosis = weakness. If due to MG, the jitter MUST be increased + impulse blocking. If normal, consider alternate diagnosis

### Links

[www.erikstalberg.com](http://www.erikstalberg.com) (for this and other EMG videos)

[www.sfemg.info](http://www.sfemg.info) (for SFEMG material including videos)

Poem on SFEMG  
St Gallen April 1, 2023  
Author RB and ES + more

In the depths of muscle, unseen  
Lies a junction, strong and keen  
Where nerve meets fiber, hand in glove  
Ready to send its message of love

But what if this connection fails?  
What if the muscle's strength pales?  
Single Fiber EMG can help us see  
The issues that lie beneath the knee

With electrodes and needles, we explore  
The fibers that make muscles move  
And through the signals that they send  
We find the truth, where troubles end

Myasthenia gravis, Lambert-Eaton too  
All can be diagnosed with this view  
Of the neuromuscular junction's might  
And the fibers that make it bright

So let us praise this test divine  
For the insights it gives us, line by line  
Into the workings of muscle and nerve  
And the secrets that they preserve.