Determining motor threshold

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Intensive Course in Transcranial Magnetic Stimulation, 10/28/2014
What are our learning objectives?

1. What is motor threshold (MT)?
2. Why determine MT?
3. What types of MT can be determined?
4. What are the available methods to determine MT?
5. What are the key steps for determining resting MT with electromyography?

→ Hands-on practice
What is motor threshold (MT)?

- The minimum amount of machine output necessary to elicit a motor response in a participant or patient in at least 50% of all attempts
- Represents membrane-related cortical excitability of cortical axons
- Depends on:
  - Inter- and intraindividual variance
  - Machine being used
  - Type of MT
  - Method of determination
  - Hemisphere stimulated
Why determine MT?

- Easy to observe
- Objective (phosphene threshold)
- Indicator of relative cortical excitability
- A way of calibrating and normalizing TMS coil output energy for inter- and intra-individual physiologic variability in experimental designs and therapeutic applications
- Determines dosage and safety limits
What types of MT can be determined?

- Resting motor threshold (RMT)
- Active motor threshold (AMT)

Proper Hand Position:
- Right
- Wrong

Determining motor threshold
What are the available methods to determine MT?

- Visual inspection
- Electromyography (EMG)
The minimum amount of machine output necessary to elicit a motor response in a participant or patient in at least 50% of all attempts

→ Minimum single-pulse stimulator output intensity resulting in motor evoked potentials (MEPs) of at least 50 μV peak-to-peak amplitude in ≥50% of pursued trials (≥5/10; Rossini-Rothwell method)
What are the key steps for determining RMT with EMG?

1. Choosing an output target
2. Setting up and safety
3. Finding the “hot spot”
4. Finding the MT
1. Choosing an output target

Determining motor threshold
1. Choosing an output target

Determining motor threshold
2. Setting up and safety
3. Finding the “hot spot”

≃5 cm lateral from vertex

(Jaspers, 1958)
3. Finding the “hot spot”

\[ \approx 5 \text{ cm lateral from vertex} \]

Draw grid around average hot spot

Determining motor threshold
3. Finding the “hot spot”

→ Use grid to find individual hot spot and mark it
4. Finding the MT

1. Set intensity to 35% and deliver a single pulse
2. Go up in steps of 5% until an MEP is observed and deliver several pulses (to ensure a consistent response is evident)
3. Record 10 MEPs
4. Progressively lower intensity in steps of 1% until ≥5/10 runs show an MEP of ≥50 μV

- Alternatives:
  - ≥3/6
  - Parameter estimation by sequential testing with the TMS Motor Threshold Assessment Tool (clinicalresearcher.org)
Thank you for your active participation and good luck for the rest of the week.

For further questions at any time:
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