Myoelectric Assistive Devices:

Does EMG distinctness reflect control ability?

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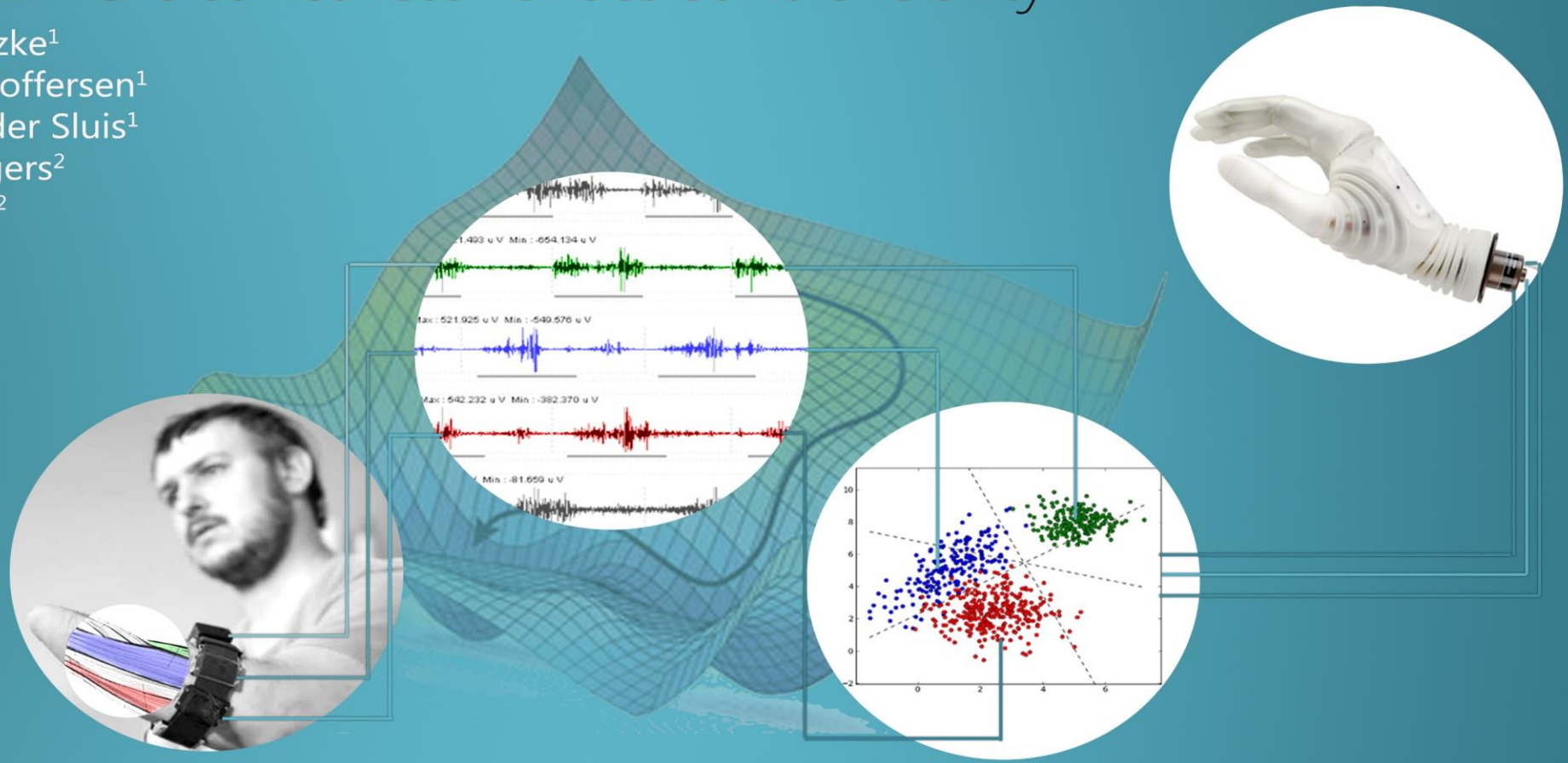

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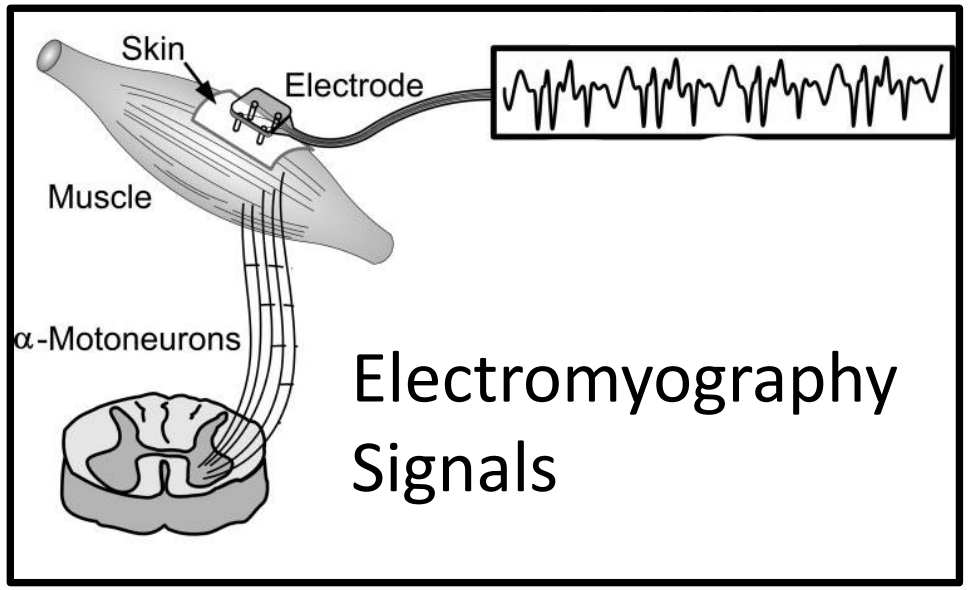
This project (INPUT) has received funding from the European Unions's Horizon 2020 research and innovation programme under grant agreement number 687795. The content of this presentation does not reflect the official opinion of the European Union. Responsibility for the information and views expressed lies entirely with the author.

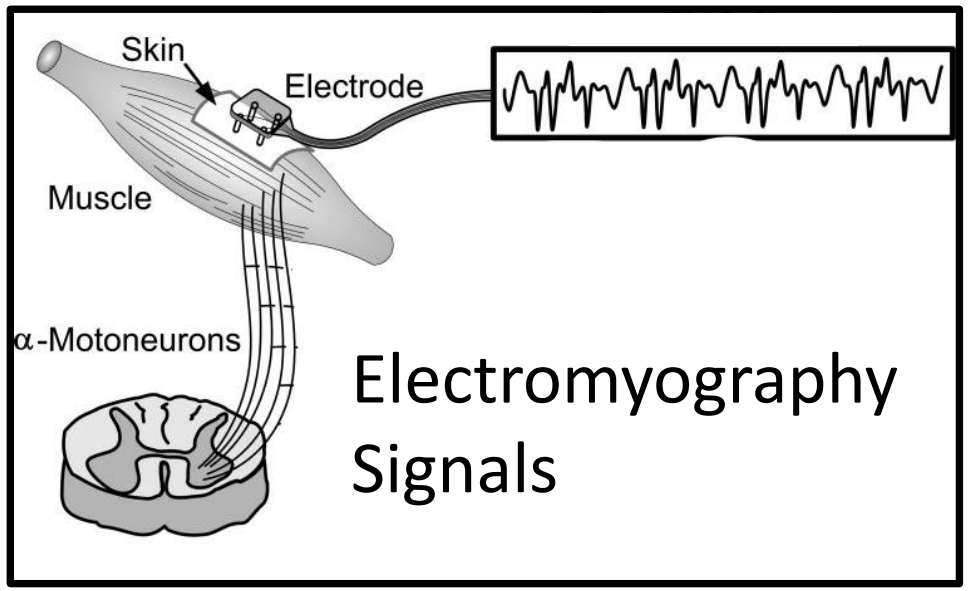
Myoelectric assistive devices?



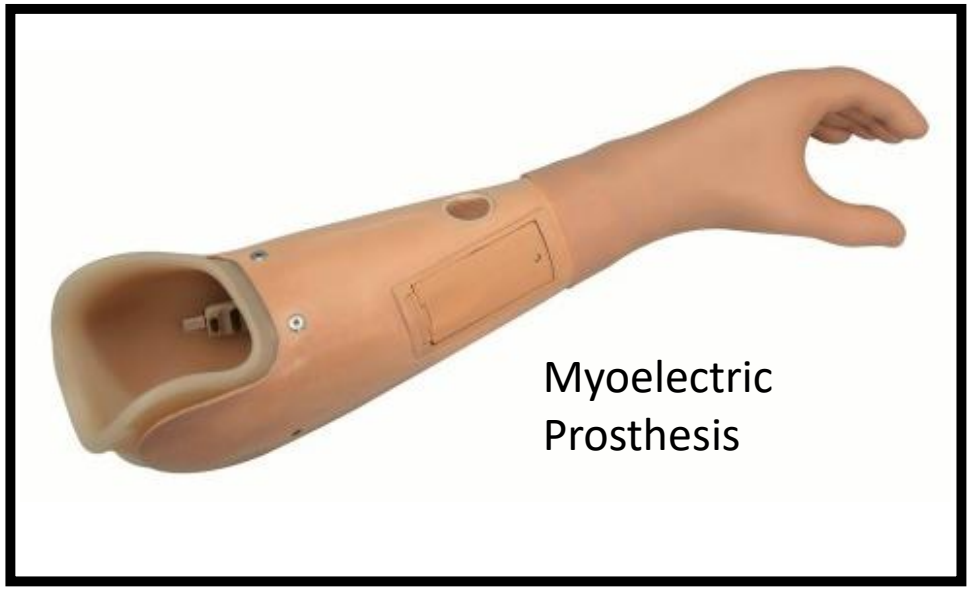
Control

Assistive Device

Myoelectric assistive devices?



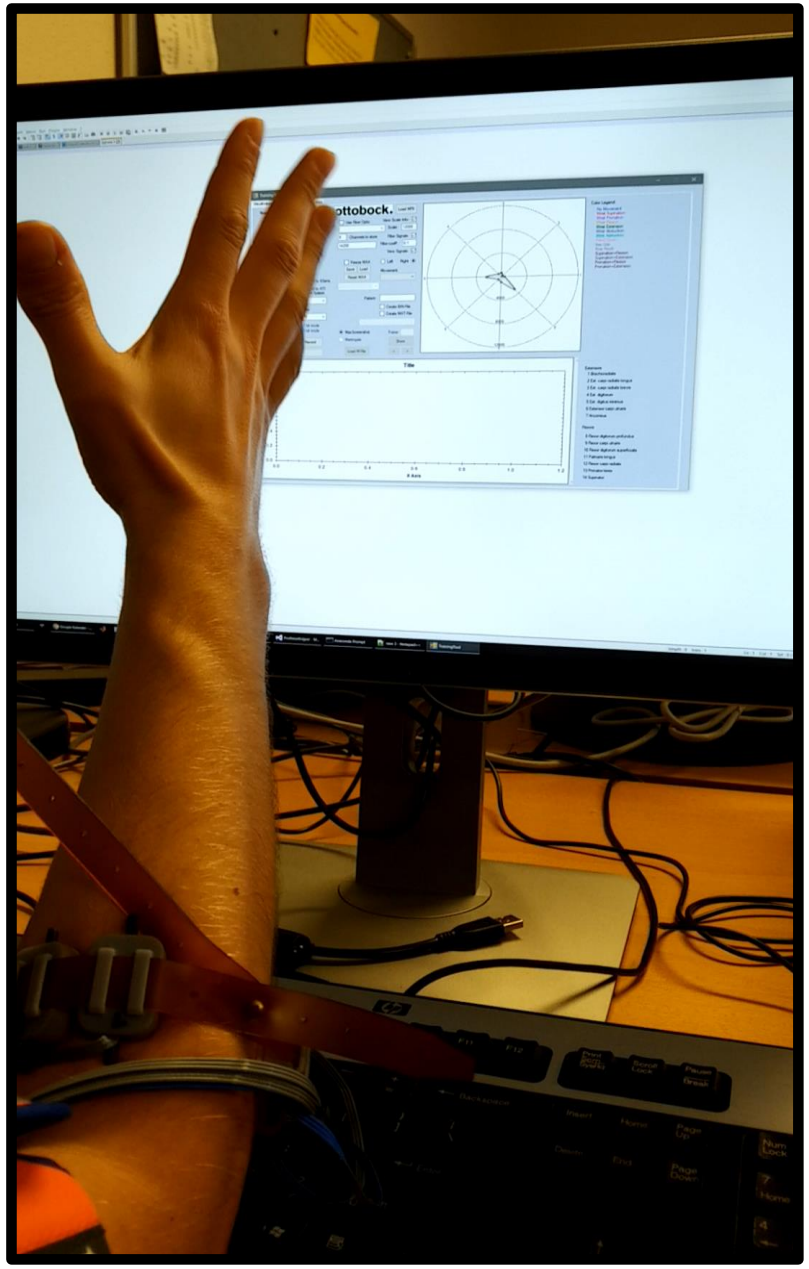
Control



= “Decode” (motion-) intent from EMG signals and translate into motion of device

Myoelectric assistive devices?

- Current state of the art:
  - Applying machine learning techniques to EMG signals (“Pattern Recognition’’)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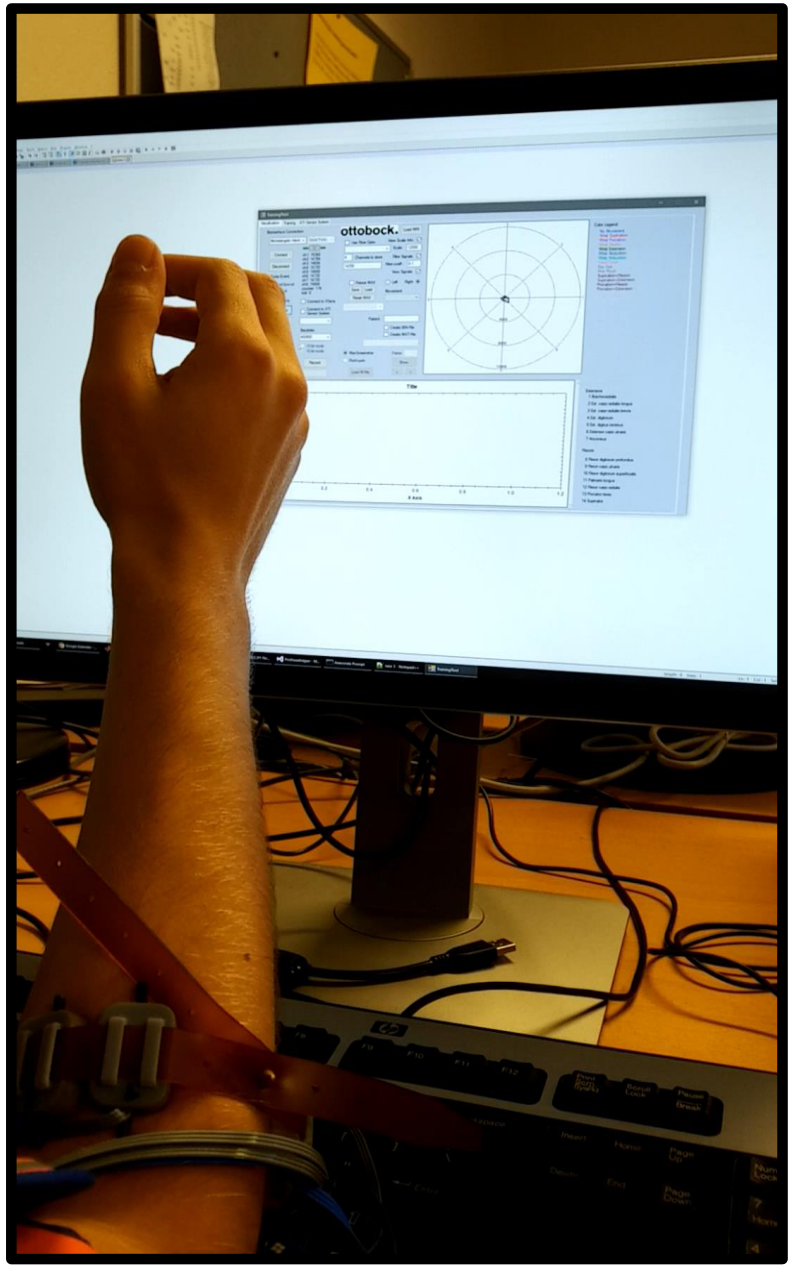
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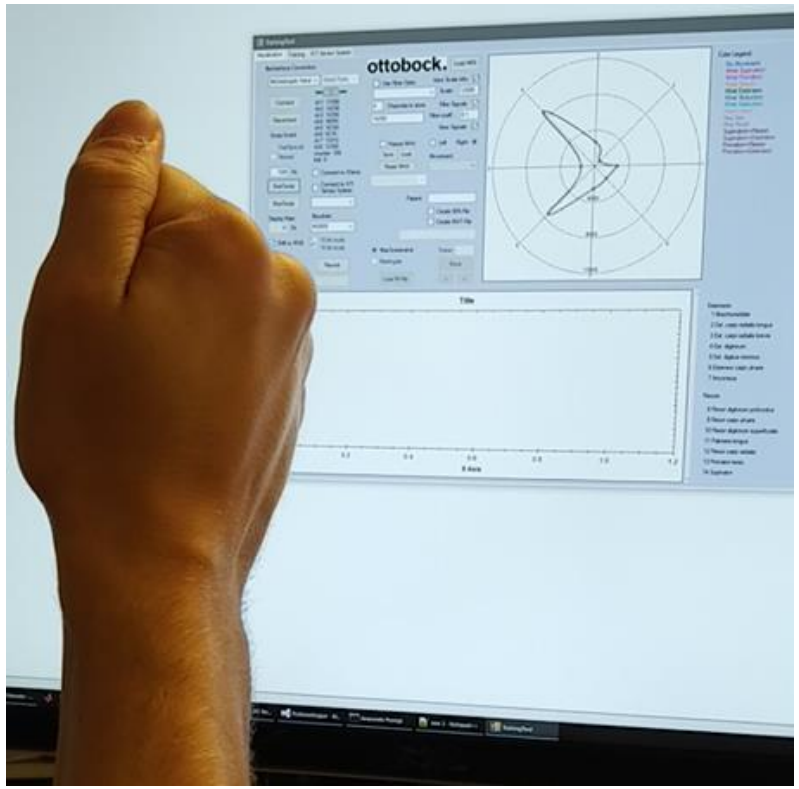

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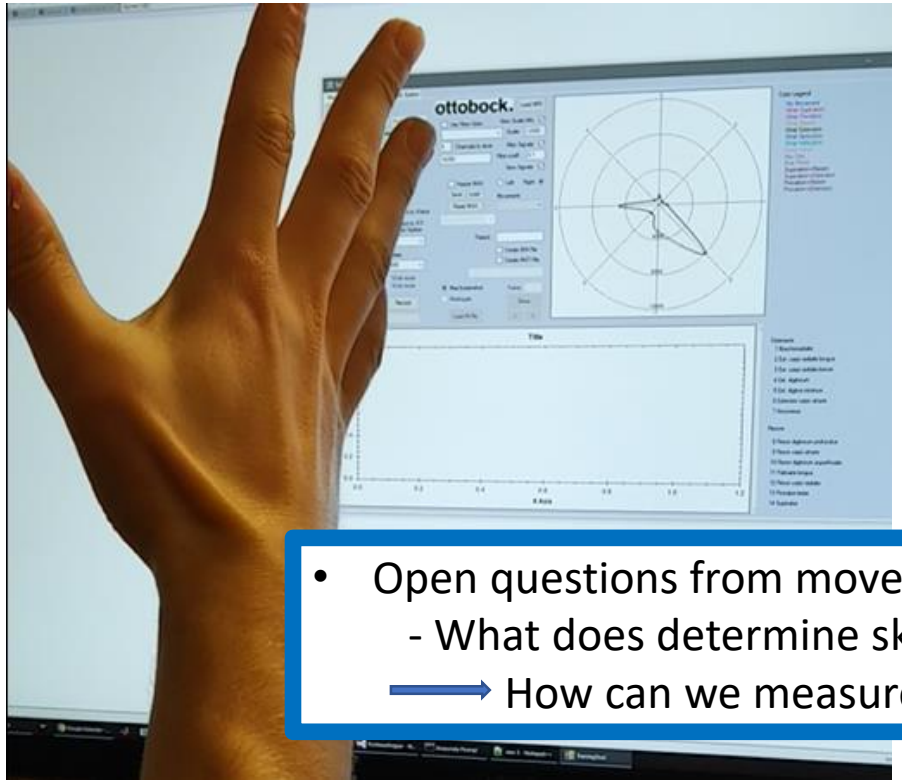
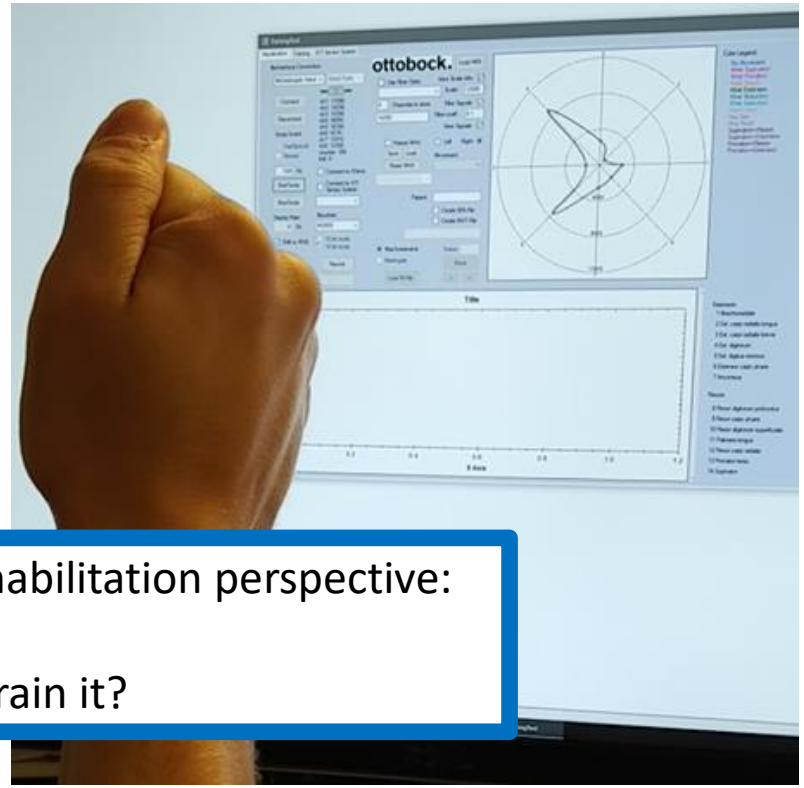
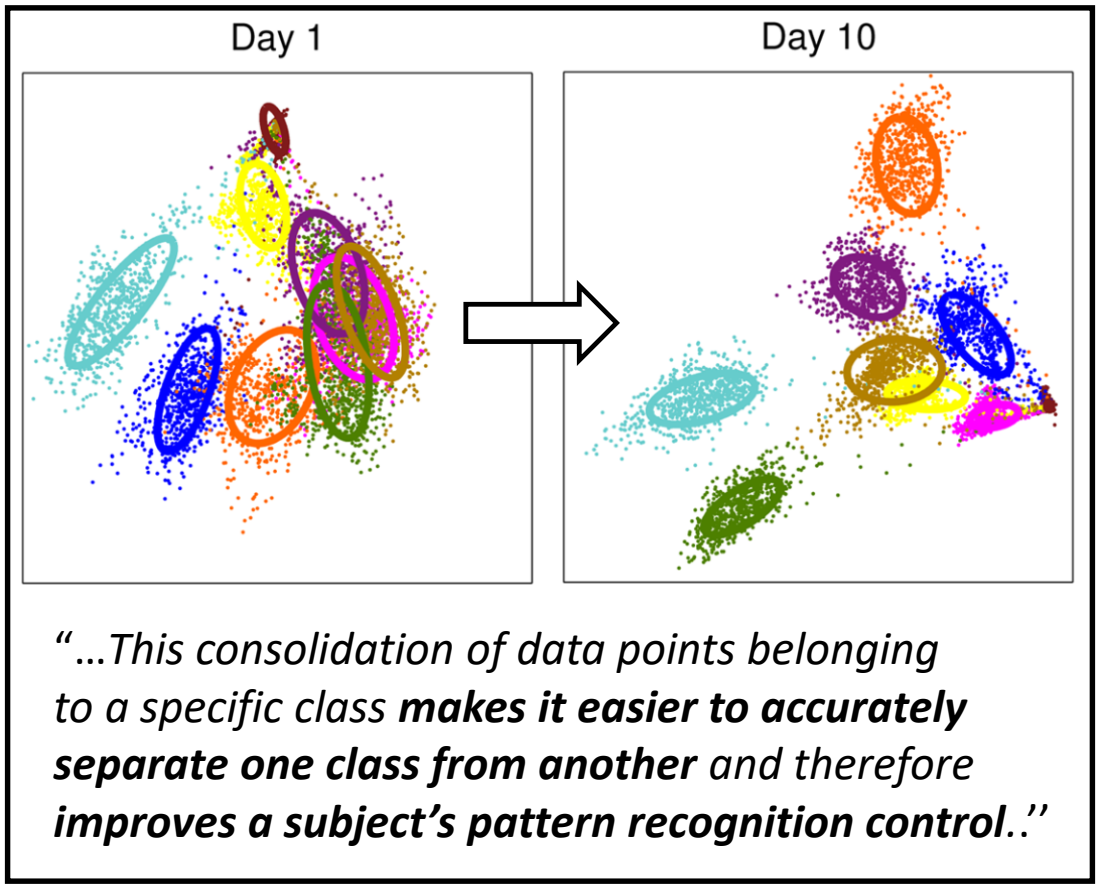




- Open questions from movement science/ rehabilitation perspective:
  - What does determine skill of a user?
  - ⟶ How can we measure it, how can we train it?

- From a machine learning perspective:
  - Calculate “Distinctness” of EMG patterns
  - Higher Distinctness = Better Control



Powell (2013)

- Few Participants (3)
- No quantification of relation control ability/ EMG distinctness

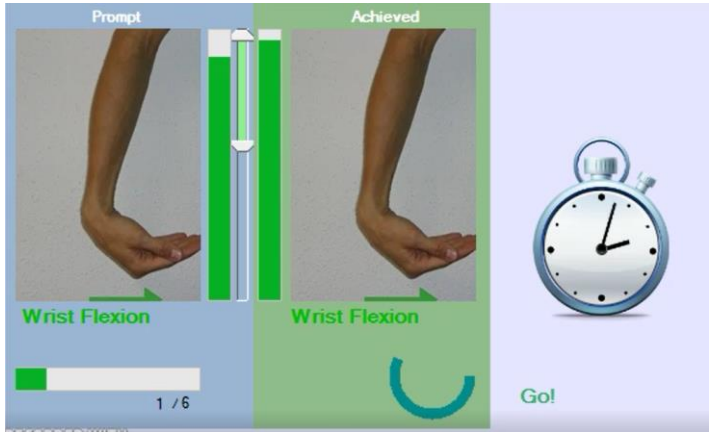
Goal of Study:

Investigate the relation between **control ability** and **EMG pattern distinctness**

- Study Setup
  - 50 Participants (able bodied)
  - 8 Surface EMG electrodes
  - Trained 7 different hand movements
  - 5 Days Training (3 training sessions each day)
    - Each Training Session:

Record EMG data

Motion Test

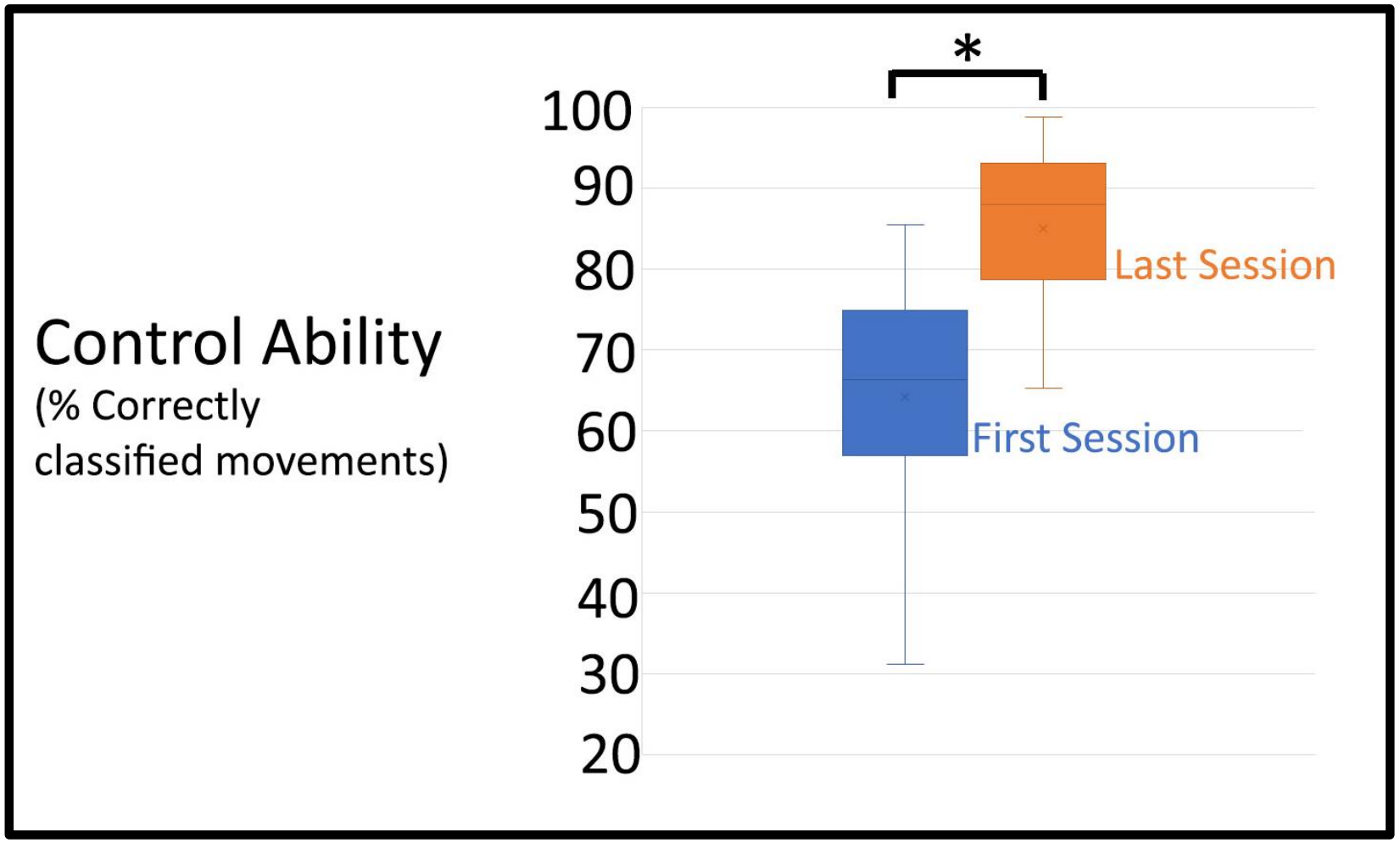


Outcomes:

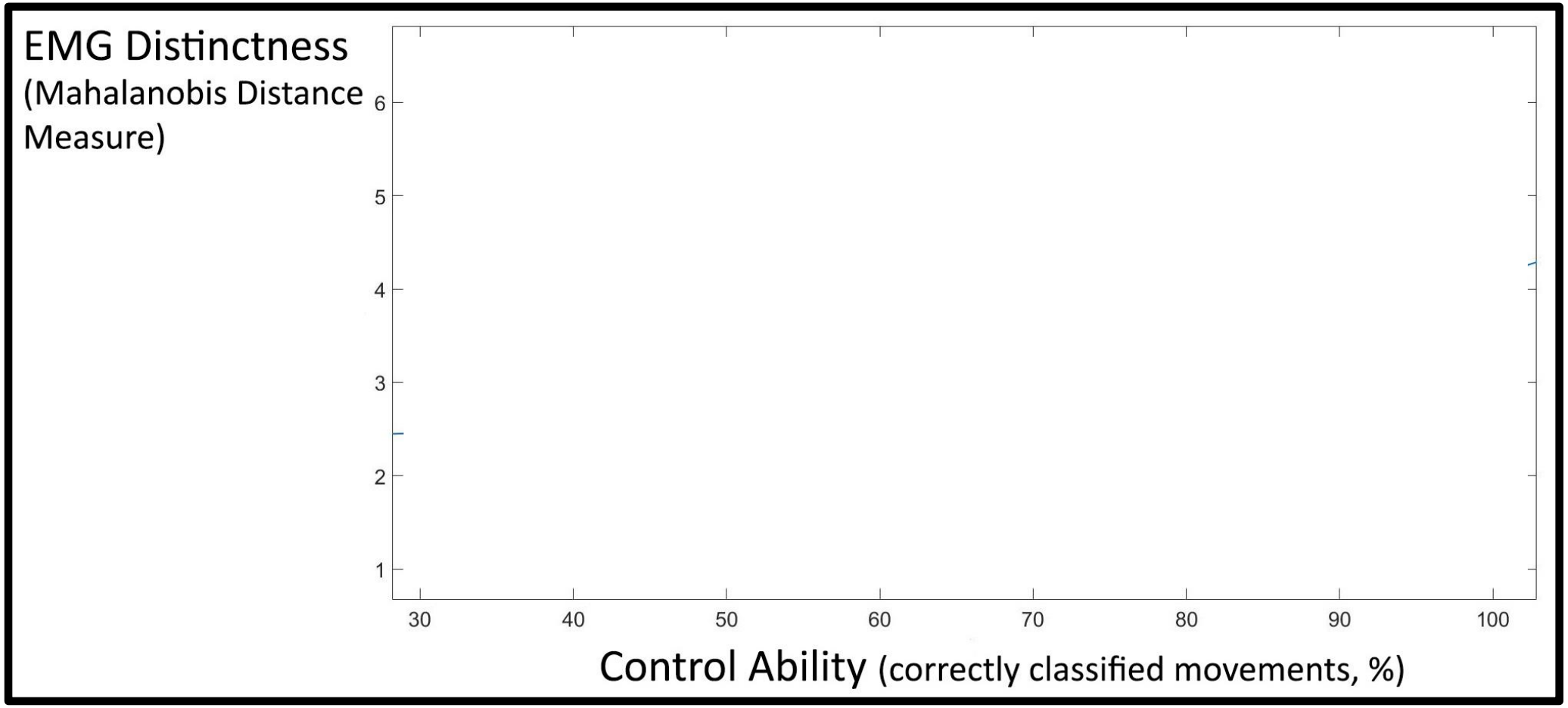
EMG distinctness
(Mahalanobis distance measure)

Control ability
(% correctly classified movements)

- Results: Control ability



- Results: EMG Distinctness vs. Control Ability



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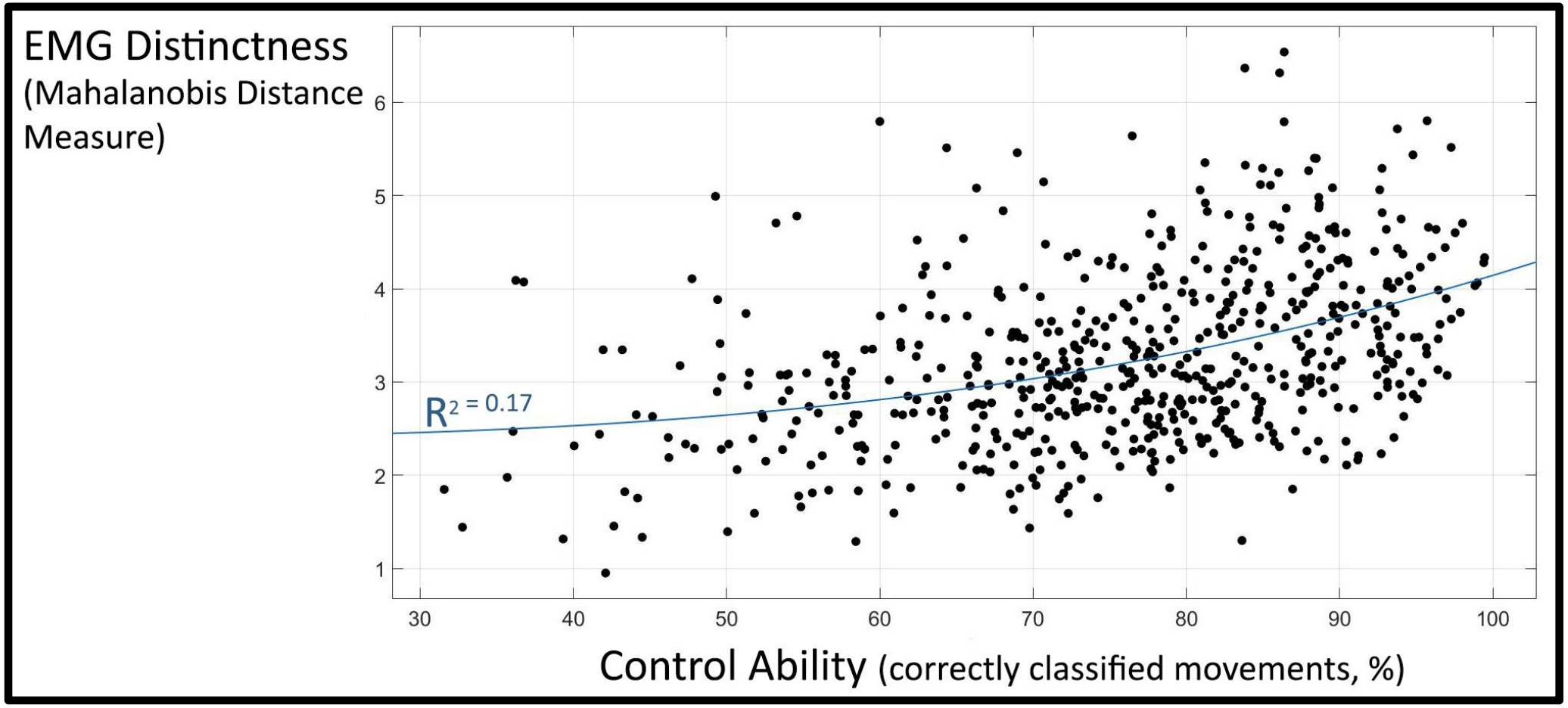

- Conclusion
  - Participants' control ability improved with training
  - But: Questionable relation between EMG distinctness and control ability

- Outlook:
  - Right metric to gauge distinctness?
  - Difference able bodied / individuals with amputation
  - Distinctness and Control Ability: Correlation vs cut-off point?

- Thank you for your attention!