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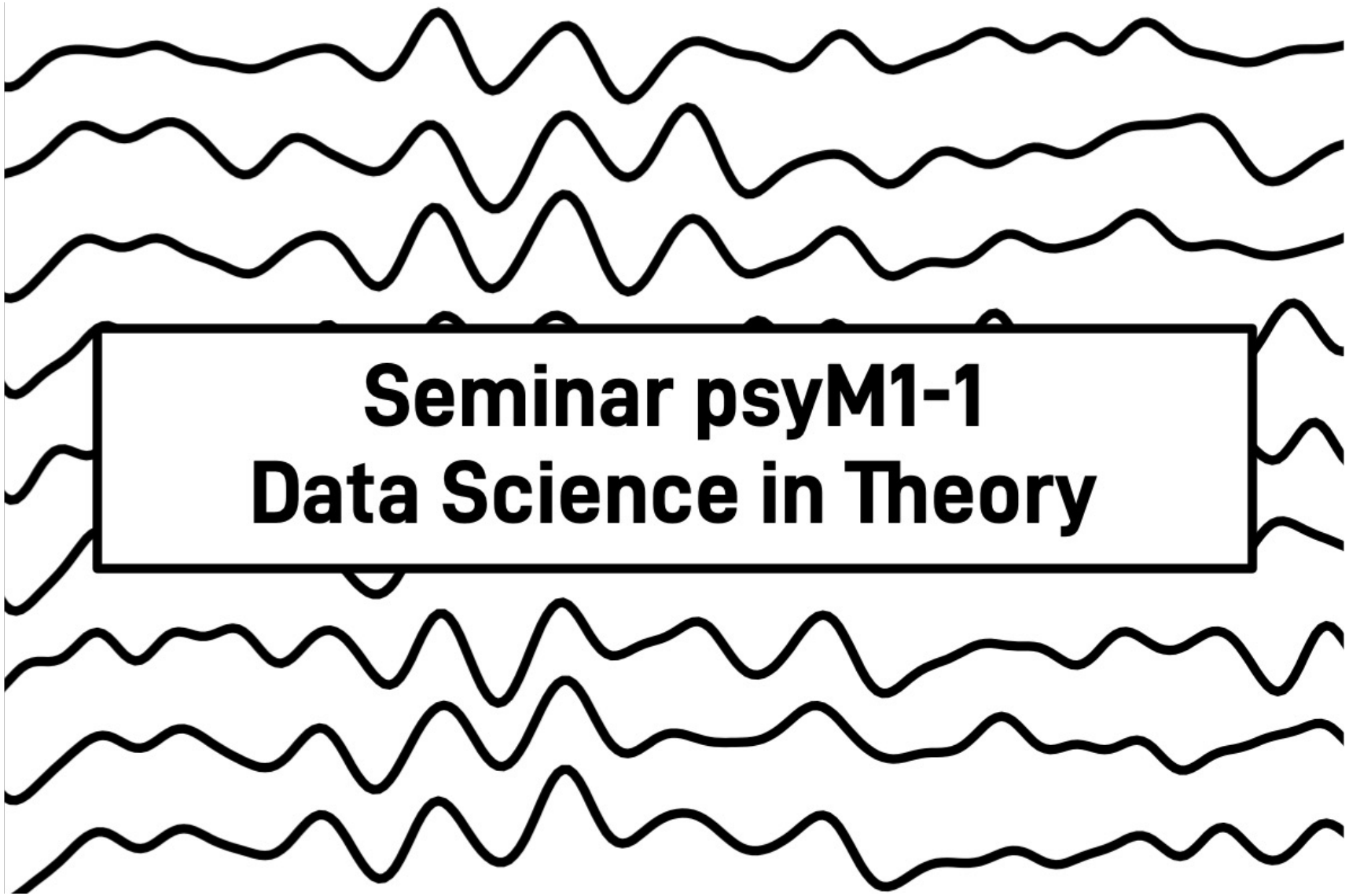

Letzte Woche

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Can these observable electrical brain signals be put to work as carriers of information in man-computer communication or for the purpose of controlling such external apparatus as prosthetic devices or spaceships?

- identify appropriate **correlates of mental states** and decisions in external signals
- identify the relevant **information carriers from the garbled** and diffuse mixture that reaches the scalp
- develop **appropriate software** within the constraints introduced by the nature of brain messages

Diese Woche

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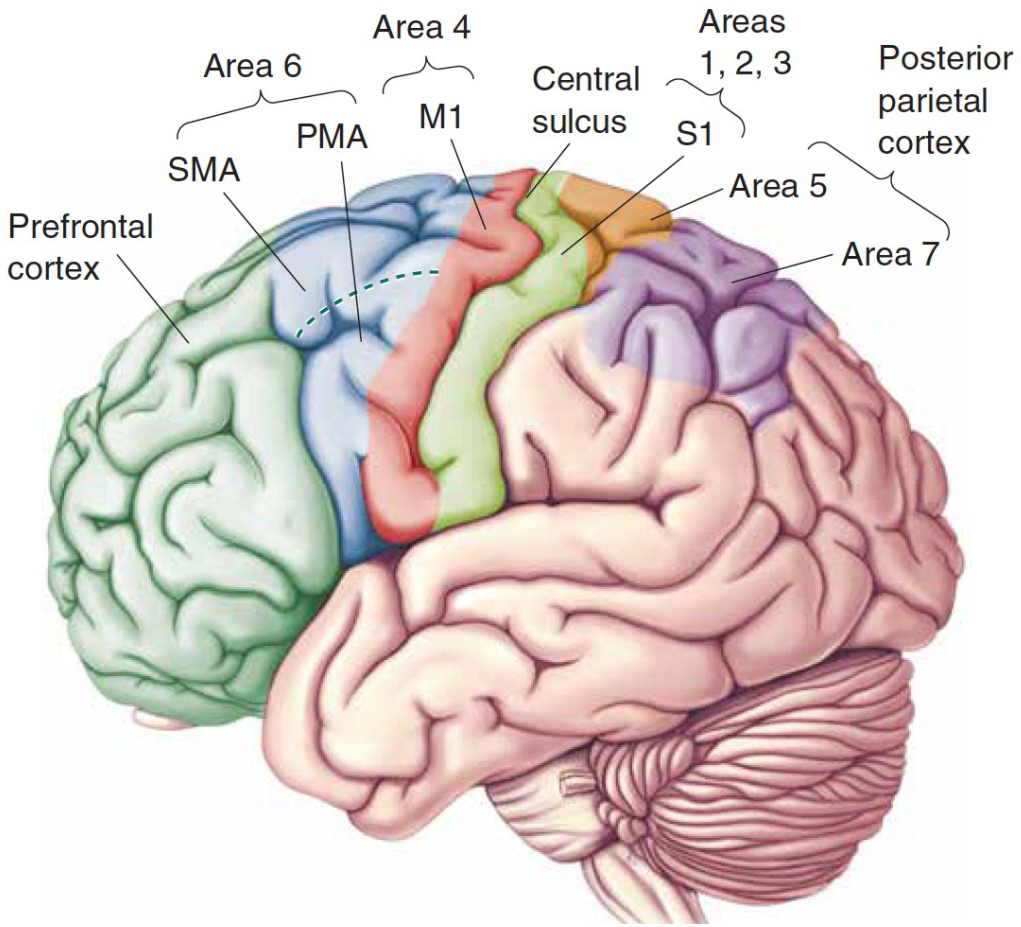
The real-time analyses of **oscillatory EEG** components during right-, and left-hand **movement imagination** allows the **control of an electric device**.



Rückblick: Motorisches System

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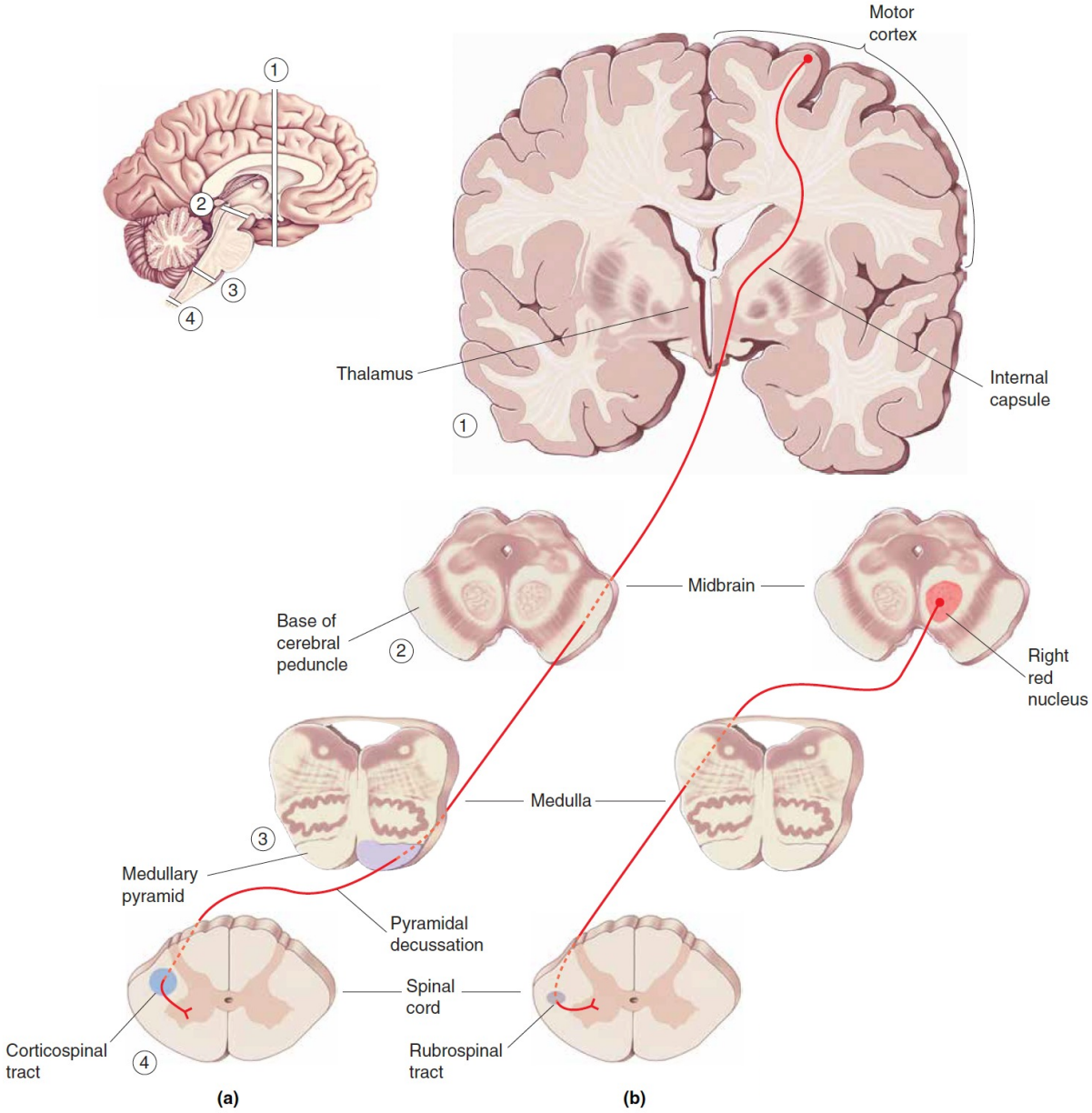
- Primärer Motorcortex
  - Somatotope Organisation, aber große Überlappung zwischen den Muskel-Bereiche
  - Direkte Verbindung zum Rückenmark
- Pyramidenbahn
  - Steuerung der präzisen Willkürbewegung
  - Distale Extremitäten



Motorisches System

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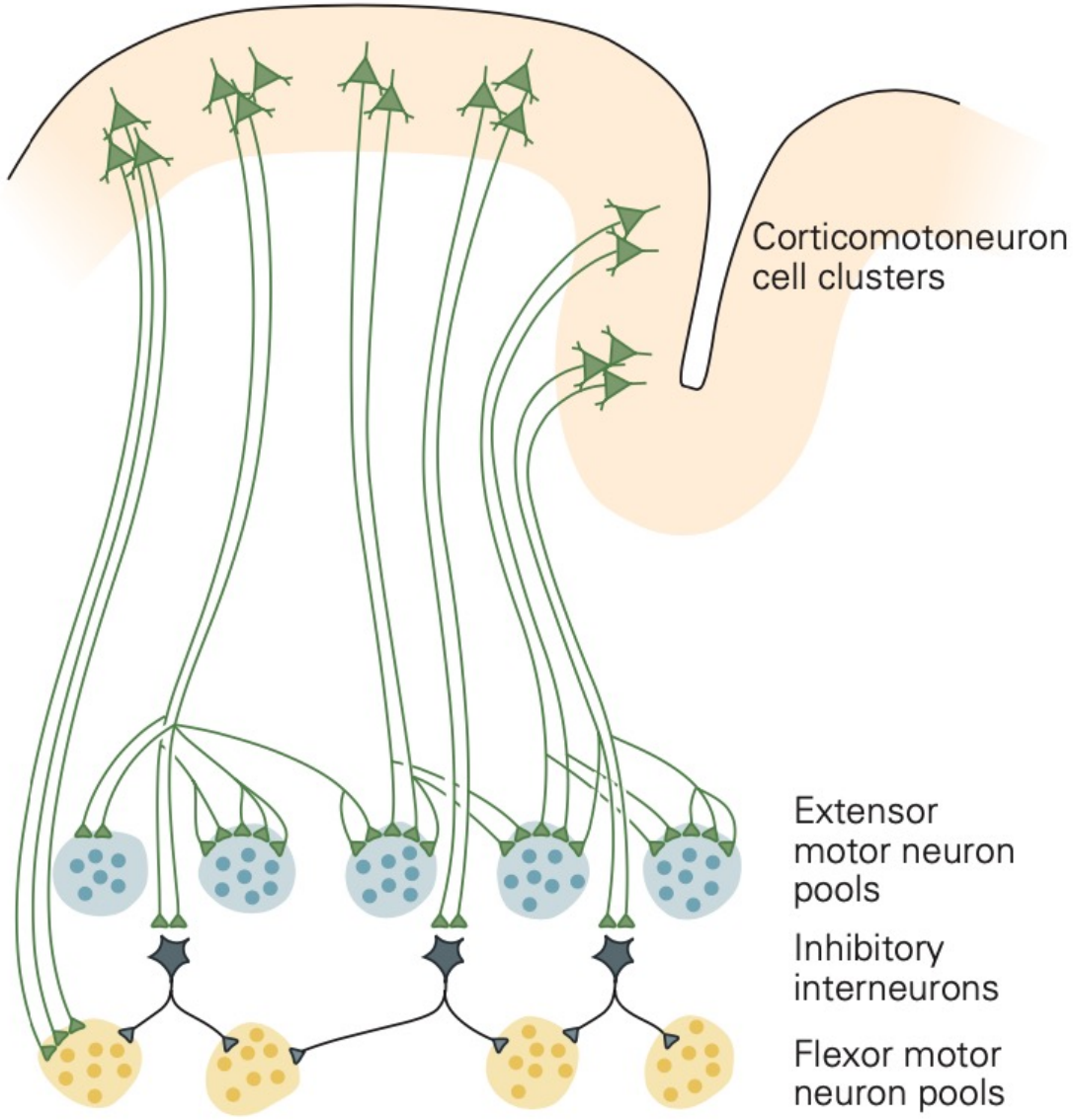
- Verschaltung im Rückenmark
  - Ein Neuron der Pyramidenbahn kann auf mehrere Motorneurone im Rückenmark verschalten
  - Gleichzeitige Aktivierung von z.B. Extensor und Hemmung von Flexor
  - Codierung von Richtung und Stärke



Bewegungssteuerung

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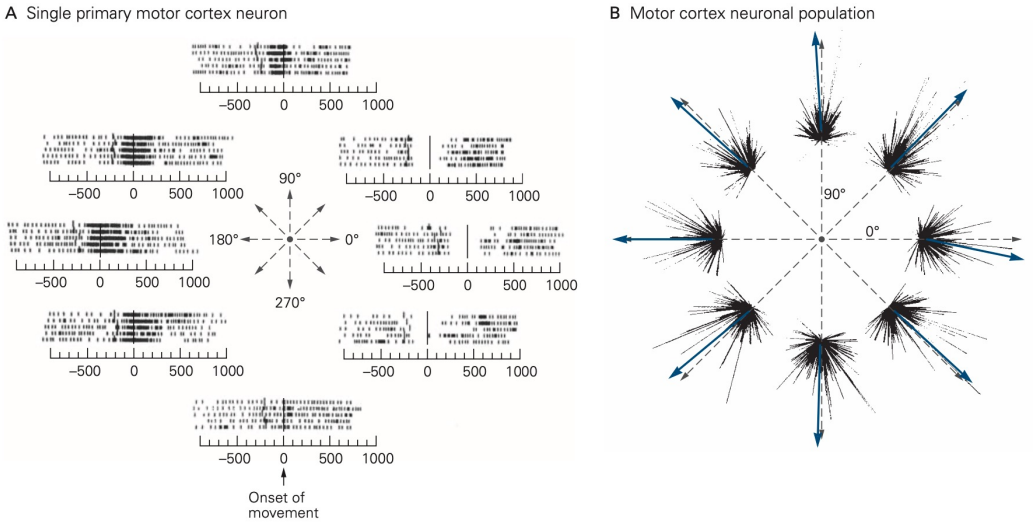
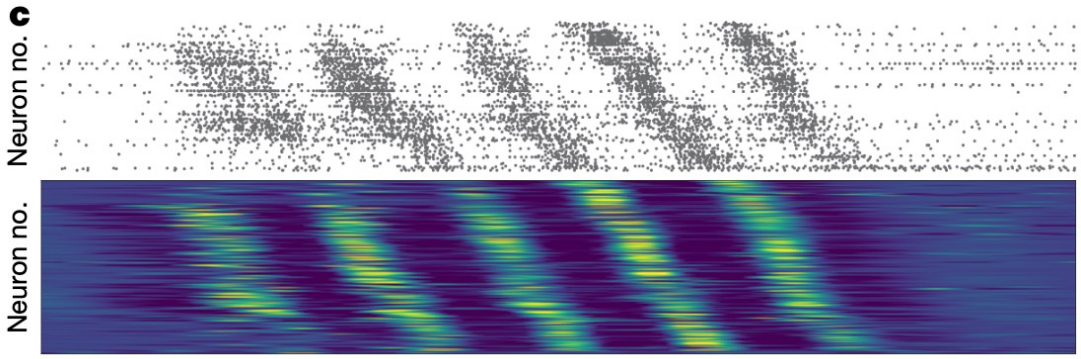
- M1-Zellen codieren bevorzugte Bewegungsrichtung
  - Gradueller Zusammenhang zwischen Feuerrate und Richtung
- Komplexe Bewegung bedarf synchrone Aktivität mehrerer Neurone
  - Population coding: Vektor-Summe ergibt Richtung





(De-) Synchronisierung

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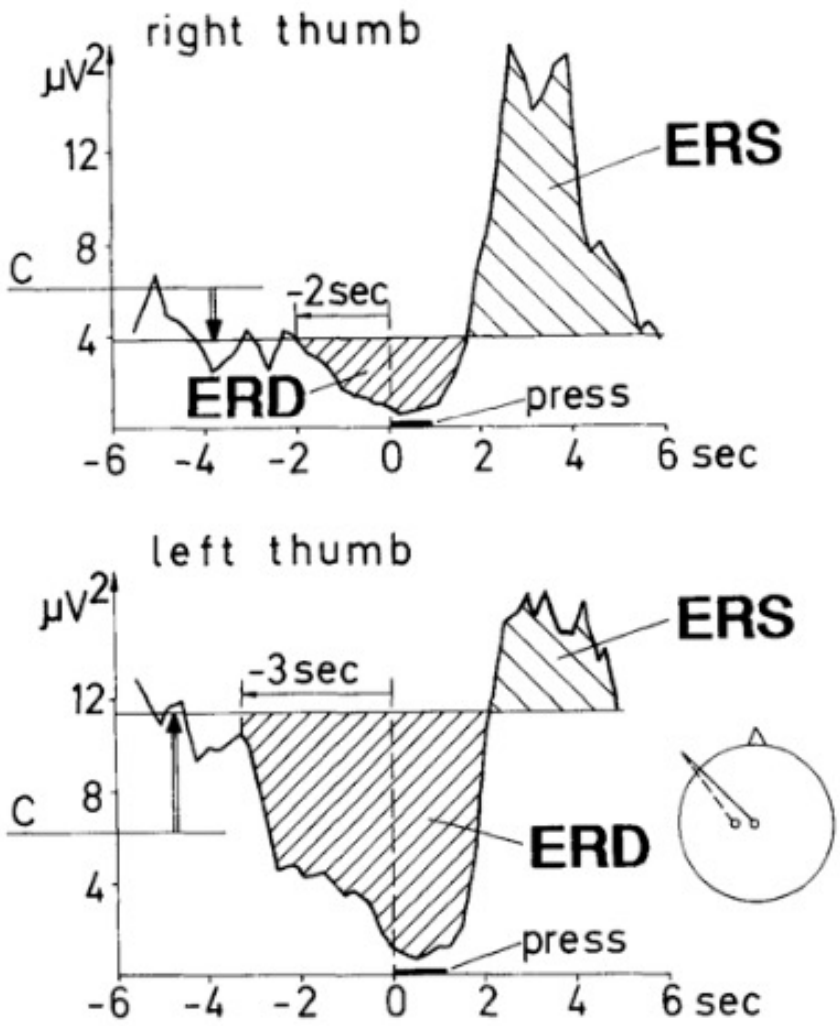
- Globale Synchronisierung
  - „Ruhe“
  - Inhibition von Informationsverarbeitung
- Lokale Desynchronisierung
  - „Aktivität“
  - Globale Aktivität zerfällt in kleine lokale Einheiten
- Lokale Synchronisierung
  - „Aktivität“
  - Gemeinsame Verarbeitung in spezialisierten Arealen (ERP)
  - Kommunikation in synchroner Aktivität



Künstliche Bewegung

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Prosthetic Control by an EEG-based Brain-Computer Interface (BCI)

Christoph Guger [1], Werner Harkam [1], Carin Hertnaes [1], Gert Pfurtscheller [1,2]
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The real-time analyses of oscillatory EEG components during right and left hand movement imagination allows the control of an electric device.

- EEG-based BCI provides a control channel without motor input
- Imagination of a movement causes Event-Related Desynchronization
- Current controversies on the topic

Nächste Woche: P300 speller

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Psychology/Psychiatry

Visual P300 Mind-Speller Brain-Computer Interfaces: A Walk Through the Recent Developments With Special Focus on Classification Algorithms

Clinical EEG and Neuroscience
2020, Vol. 51(1) 19–33

DOI: 10.1177/1550059419842753
journals.sagepub.com/home/eeg
SAGE

Jobin T. Philip[1] and S. Thomas George[1]

Brain-computer interfaces are sophisticated signal processing systems, which directly operate on **neuronal signals** to identify specific human **intents**.

- What is the P300 and what does it represent?
- What are the basic principles of classifiers?
- Are the P300 spellers useful yet?

Literatur

Christian-Albrechts-Universität zu Kiel

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