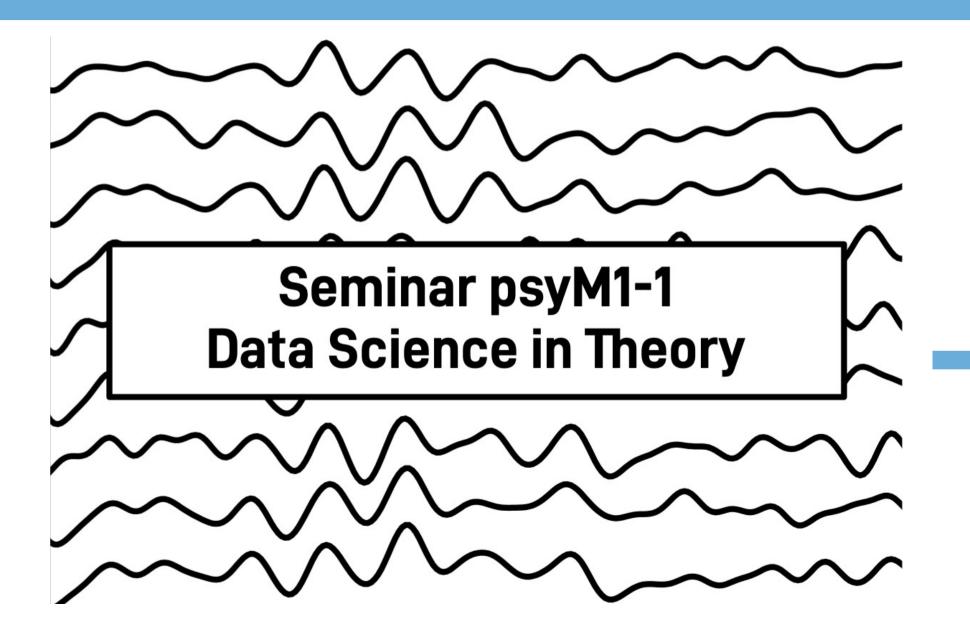


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Letzte Woche: Intention vorhersagen?



ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Issue: The Year in Cognitive Neuroscience

Decoding and predicting intentions

John-Dylan Haynes

Bernstein Center for Computational Neuroscience Berlin, Charité-Universitätsmedizin Berlin, Germany

There has been a long debate on the existence of brain signals that precede the outcome of decisions, **even before subjects believe they are consciously making up their mind**. [...] This suggests that a causal chain of events can occur outside subjective awareness even before a subject makes up his/her mind.

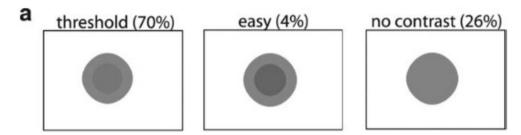
- What is free will?
- What **criteria** have to be met for a causal relationship?
- How good is the prediction of free choice?

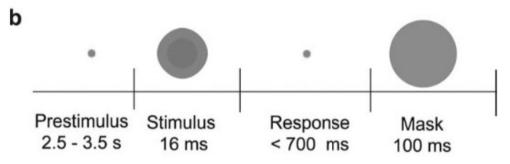


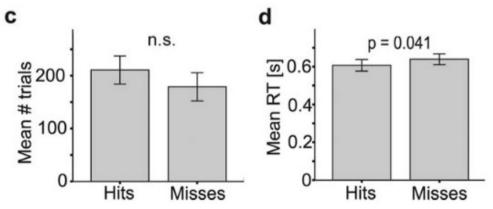
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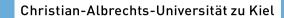
Perceptual Decisions

- Bestimmung der Wahrnehmungsschwelle
 - Binäre Antwort: Reiz ja oder nein
- 2. Präsentation von Reizen um Wahrnehmungsschwelle herum
 - Über Schwelle: Hits > Misses
 - Unter Schwelle: Hits < Misses
 - An Schwelle: Hits = Misses
- 3. Ist Verhalten an Schwelle zufällig, oder durch Hirnaktivität bestimmt?

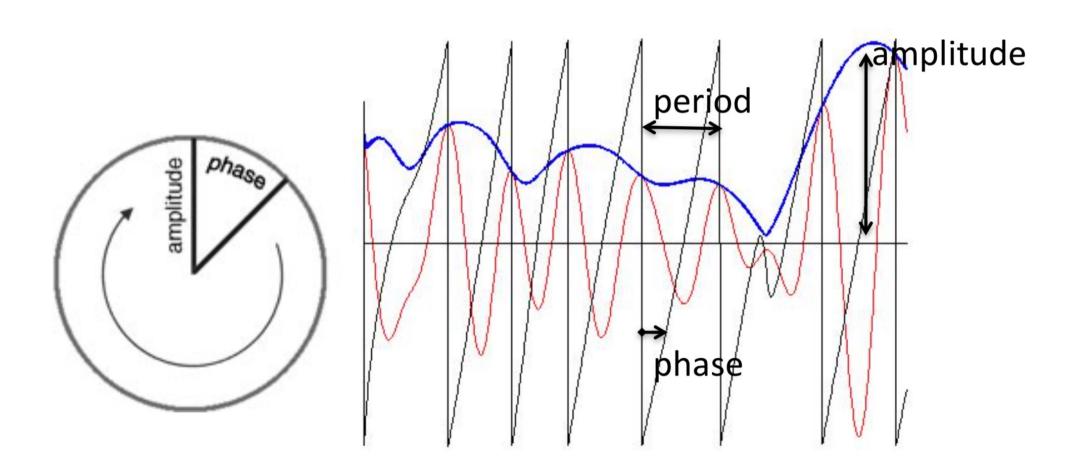








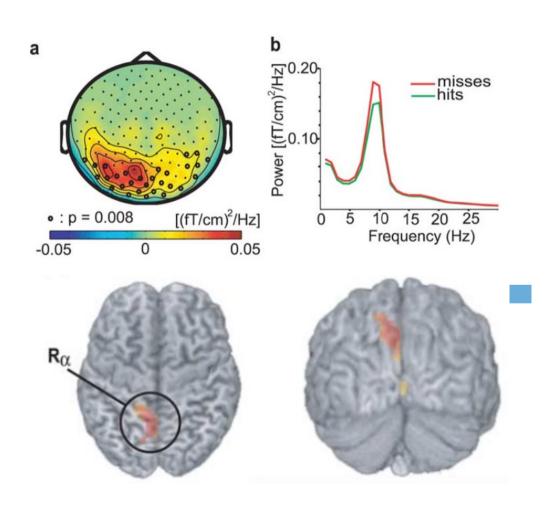
Frequenz, Phase, Amplitude



Fluktuationen neuronaler Aktivität: Power



- Am Threshold:
 - Alpha-Power unterschiedlich: Hits < Misses
- Berger: Alpha-Amplitude immer dann hoch, wenn Versuchsperson gerade nichts macht
 - Starkes Alpha: Reduzierte Aufmerksamkeit
- Quelle: Precuneus
 - Relevant f
 ür Steuerung visueller Aufmerksamkeit

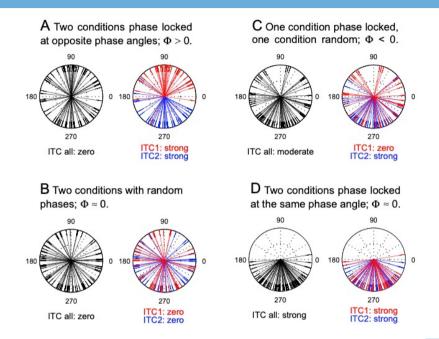


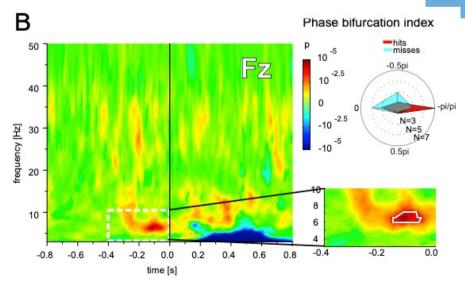
Fluktuationen neuronaler Aktivität: Phase



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- ITC: Wie konsistent ist die Phase über Trials hinweg?
- Am Threshold:
 - Theta-ITC unterschiedlich:
 - Hits und Misses mit unterschiedlichen Phasen assoziiert
- Frontales Theta steuert Aufmerksamkeit
 - Phasenabhängige zuweisung von Verarbeitungskapaziutäten
- Quelle: ACC?
 - Relevant für Steuerung visueller
 Aufmerksamkeit







Befunde und Kontroversen

- Alpha-Power und Theta Phase zum Zeitpunkt der Reizdarbietung beeinflussen die Wahrnehmung
 - "Brain state" sagt vorher, ob ein schwacher Reiz verarbeitet wird
- Aber:
 - Einfluss vorheriger Entscheidungen?
 - Wählen Versuchspersonen bei Unsicherheit einfach die gleiche Antwort wie im letzten Trial?
 - Woher kommt Aktivität vor Reizdarbietung?
 - Low-Pass-Filter glätten und verschmieren das Signal und können so Post-Stimulus nach Pre-Stimulus verschieben (auch bei sog. Zero-phase Filtern).
 - Funktioneller Ursprung der Fluktuationen?
 - Aufmerksamkeit?
 - Sensory Gating?
 - ?

Diese Woche: Entscheidungsverhalten modellieren



Behavioral/Systems/Cognitive

Predicting Perceptual Decision Biases from Early Brain Activity

Stefan Bode, David K. Sewell, Simon Lilburn, Jason D. Forte, Philip L. Smith, and Jutta Stahl

Melbourne School of Psychological Sciences, The University of Melbourne, Parkville, Victoria 3010, Australia, and Department of Psychology, University of Cologne, 50969 Cologne, Germany

Perceptual decision making is believed to be driven by the accumulation of sensory evidence following stimulus encoding. More controversially, some studies report that neural activity preceding the stimulus also affects the decision process.

- What is drift diffusion modelling?
- How do choices differ depending on the available information?
- How does prior information bias choices?

Nächste Woche: Abstrakte Entscheidungen vorhersagen?



Predicting free choices for abstract intentions

Chun Siong Soon^{a,b,c,d,e,1}, Anna Hanxi He^{b,f}, Stefan Bode^{b,e,g}, and John-Dylan Haynes^{a,b,d,e,h,1}

Unconscious neural activity has been repeatedly shown to precede and potentially even influence subsequent free decisions. However, to date, such findings have been mostly restricted to **simple motor choices**, and despite considerable debate, there is no evidence that the outcome of more complex free decisions can be predicted from prior brain signals. [...] Our results suggest that **unconscious preparation of free choices is not restricted to motor preparation**. Instead, decisions at multiple scales of abstraction evolve from the dynamics of preceding brain activity.

- What is the Default Mode Network?
- What is the difference between simple and abstract choices/intentions?
- What is the role of different cortical areas for content and timing of choices?



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