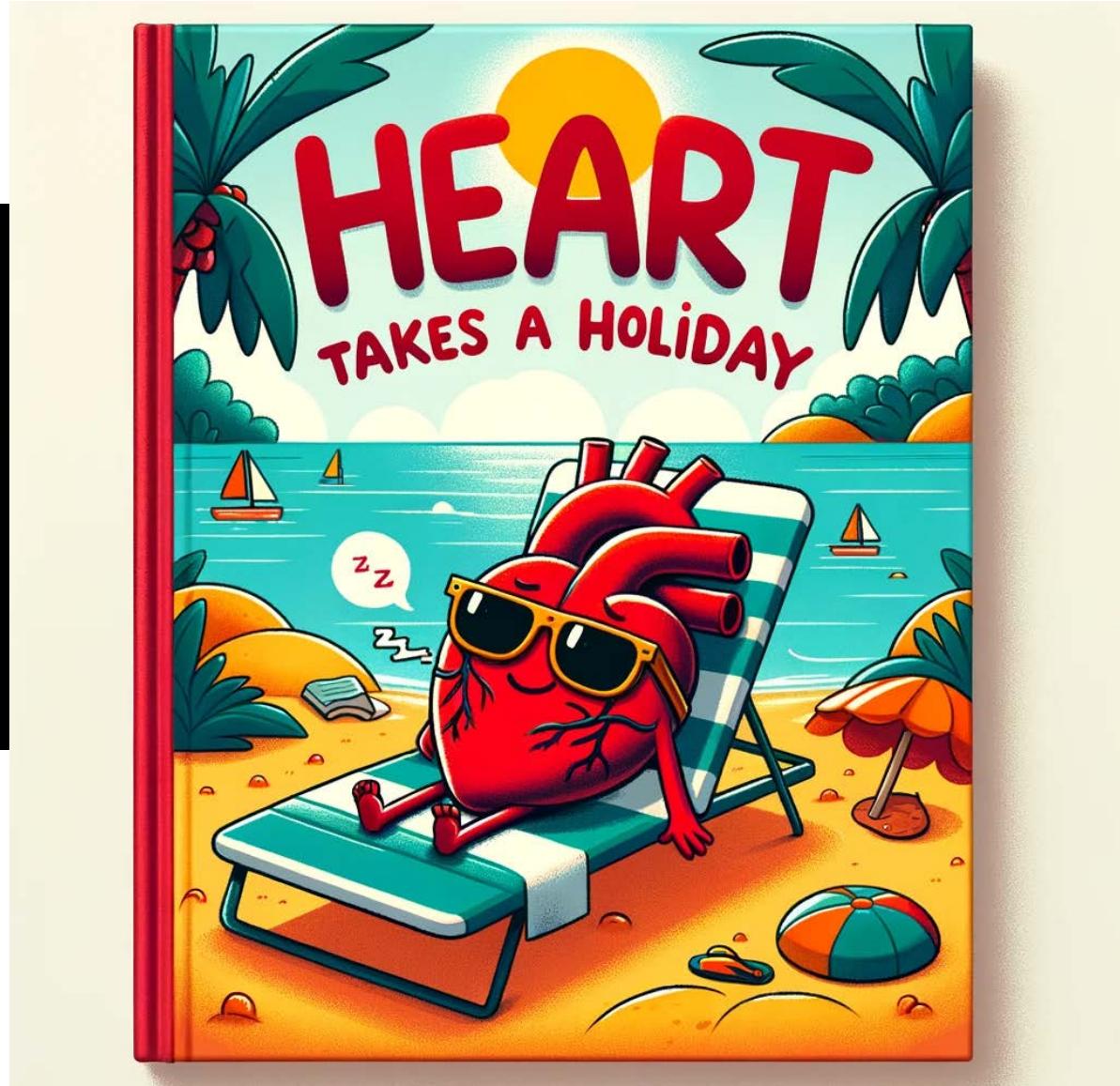


GEHIRNWELLEN IM SCHLAF UND KARDIOVASKULÄRE GESUNDHEIT

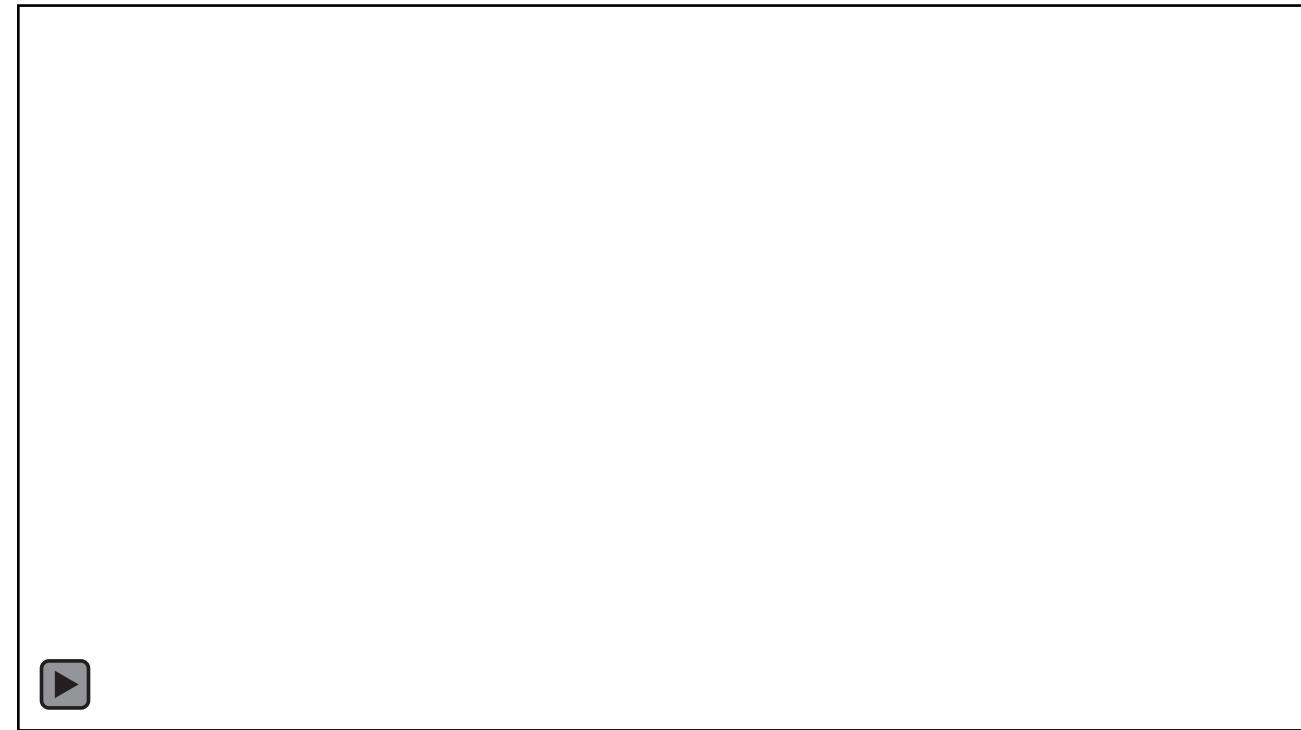
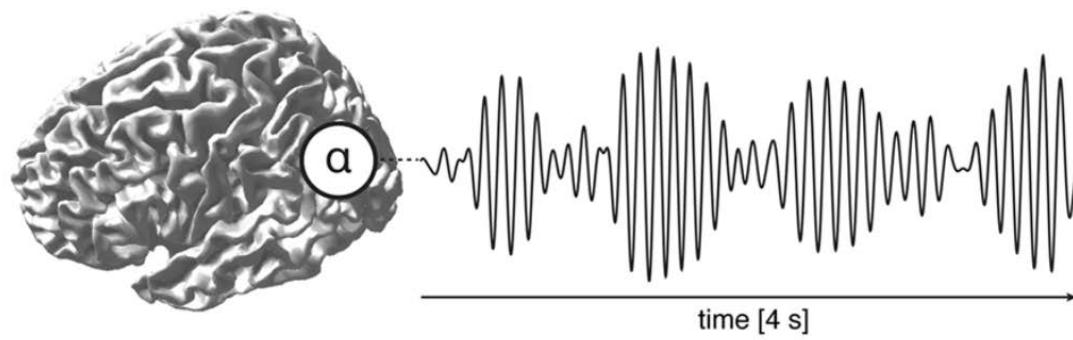
PD Dr. Caroline Lustenberger



„Während des Schlafes ist der Geist ebenso untätig wie der Körper, und das Leben ist fast wie im Tod.“

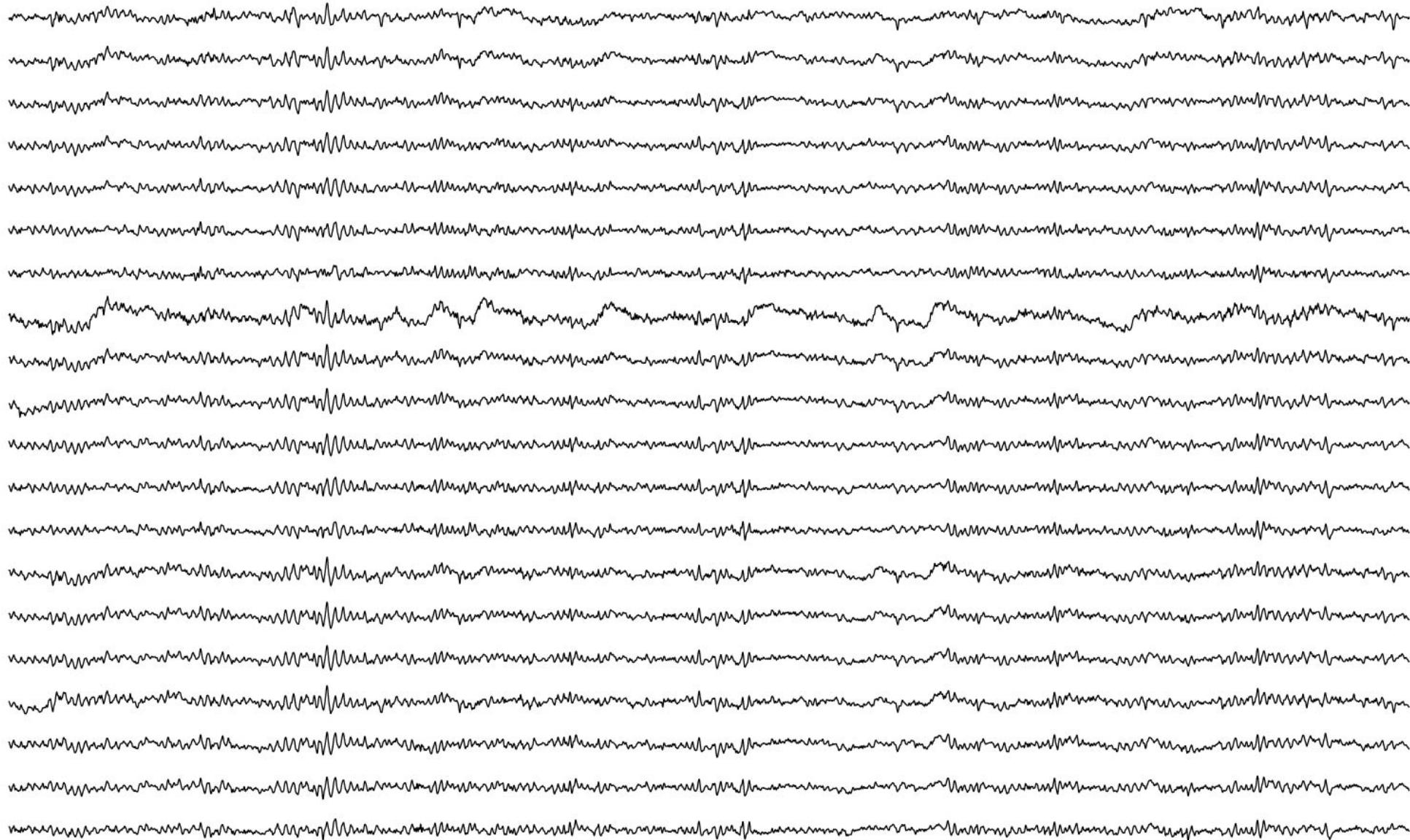
Jean-Jacques Rousseau (1712–1778), französischer Philosoph

MIT DEM EEG DAS GEHEIMNIS DES SCHLAFS LÜFTEN

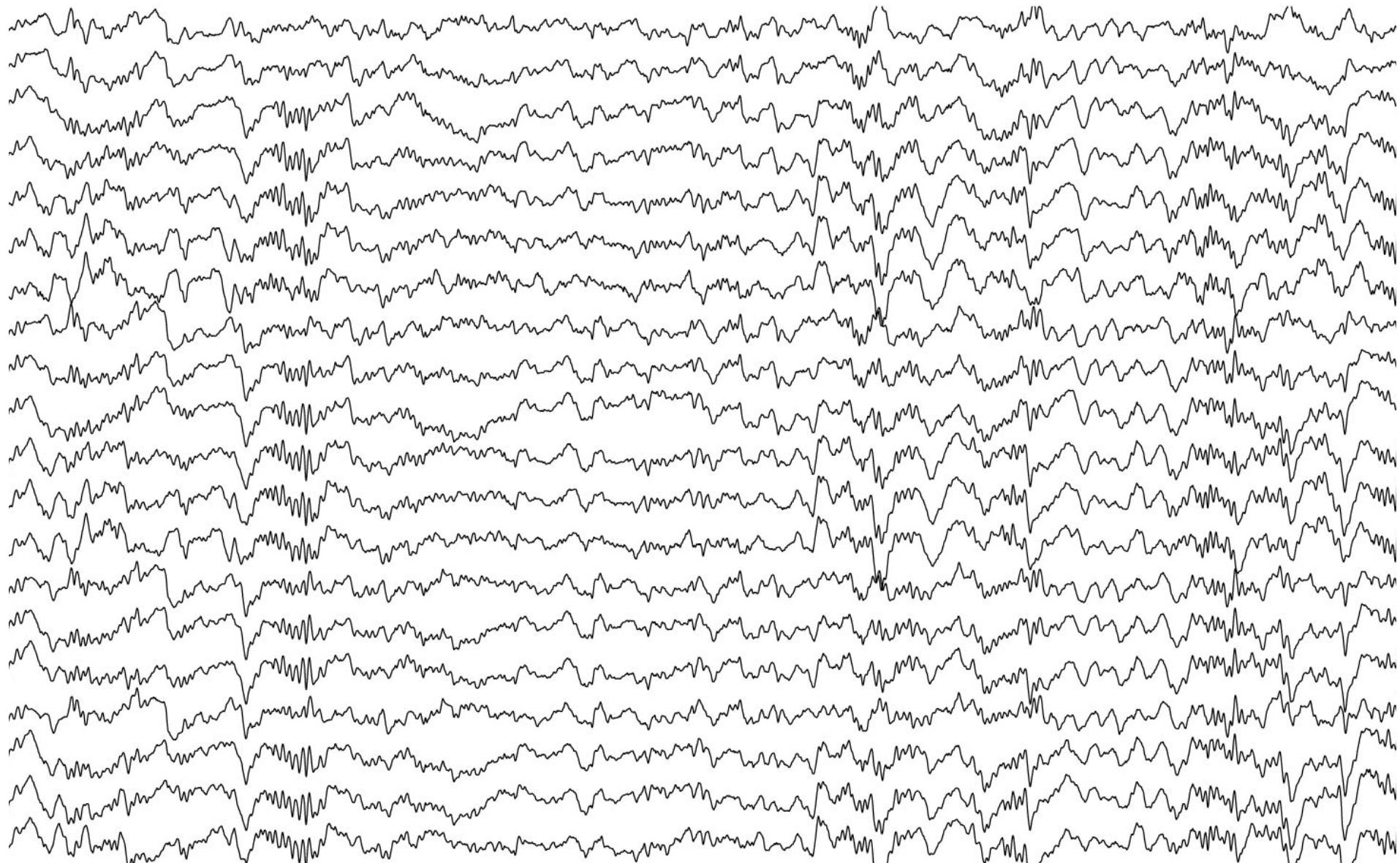


Ram and Helfrich, *Front. Young Minds*, 2017

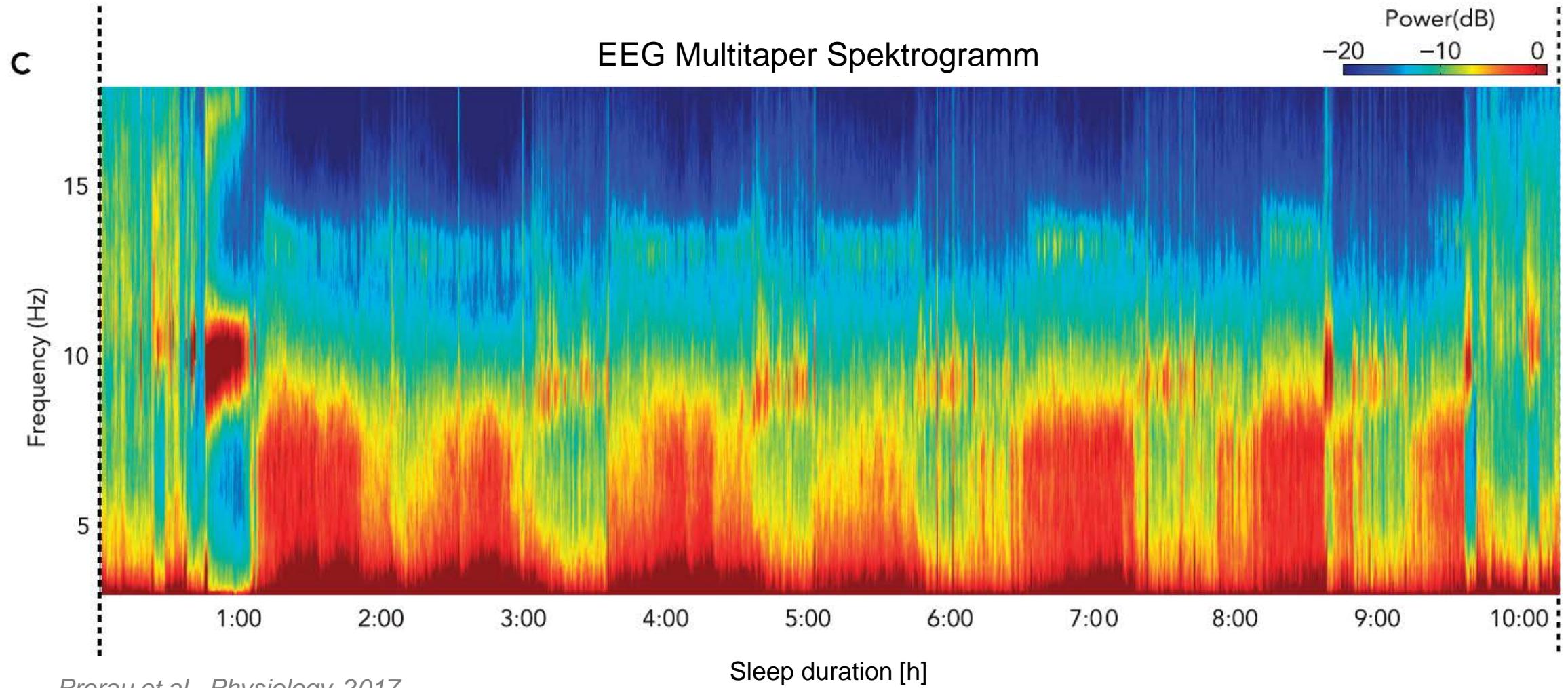
GEHIRNWELLEN WÄHREND DES WACHSEINS



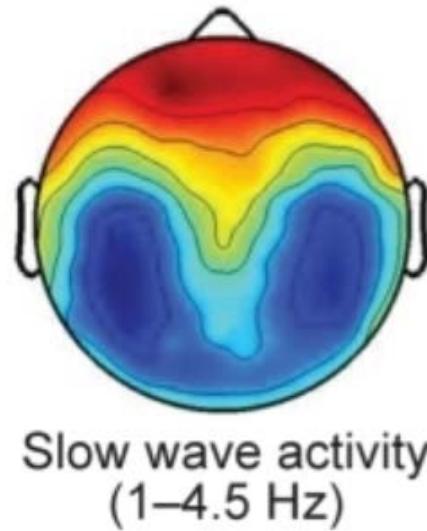
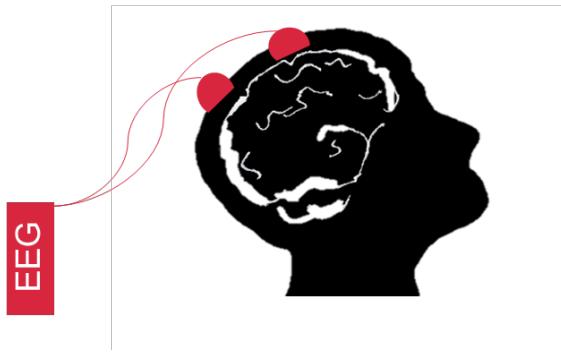
GEHIRNWELLEN WÄHREND DES SCHLAFES



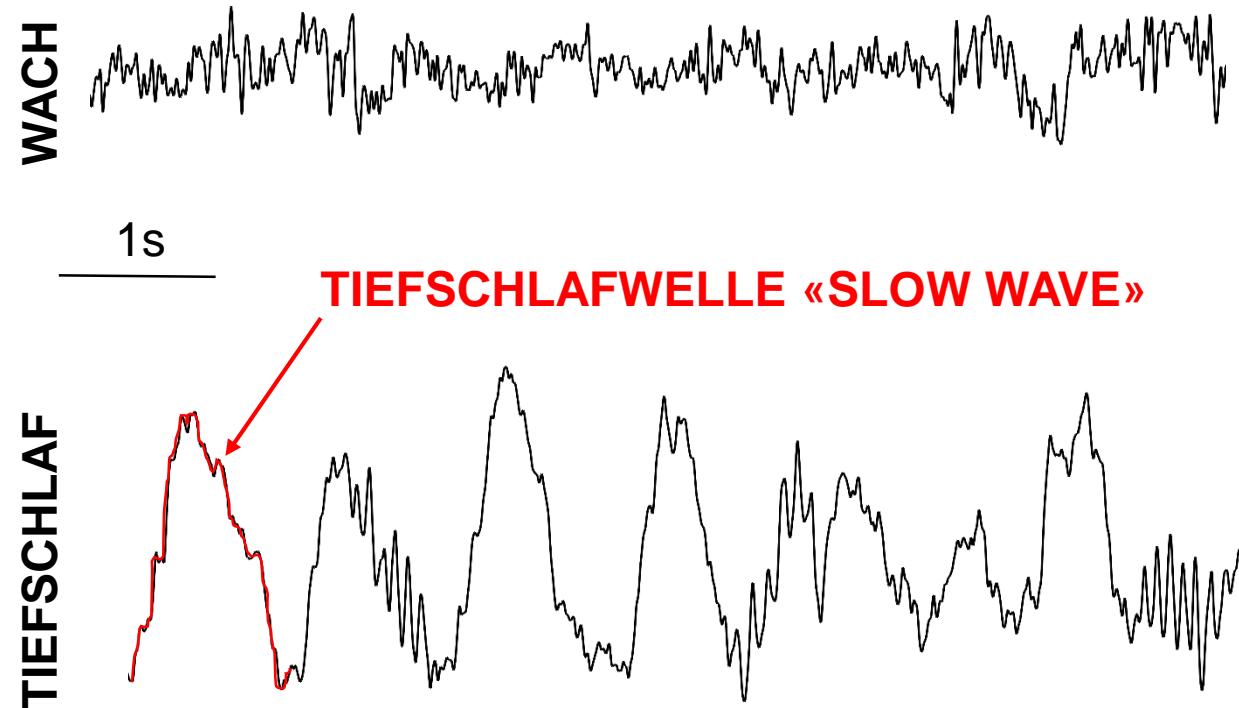
DIE SYMPHONIE WÄHREND DES SCHLAFES



GEHIRNWELLEN WÄHREND DES TIEFSCHLAFES



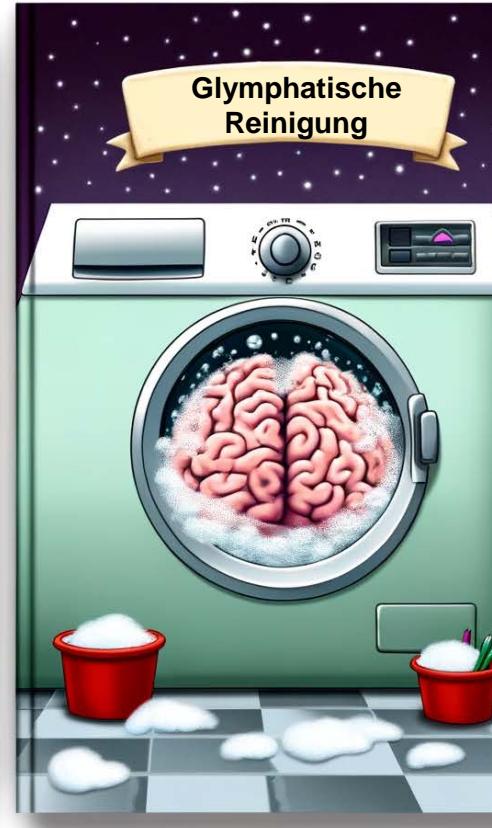
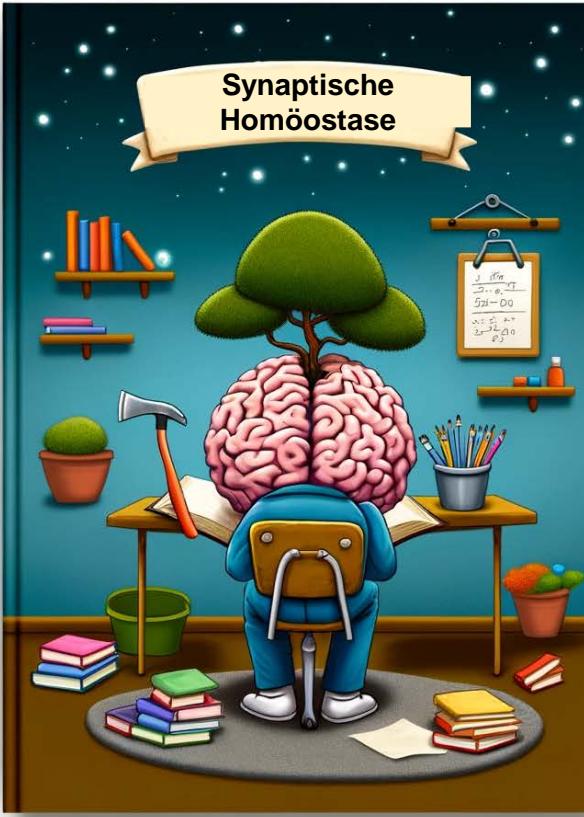
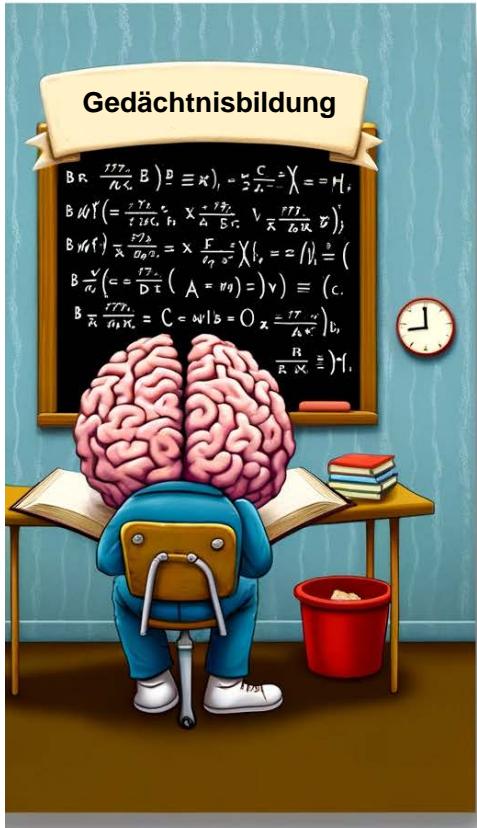
Tononi, JCSM, 2019



SCHLAF FÜR DIE HIRNGESUNDHEIT

"Sleep is of the brain, by the brain and for the brain "

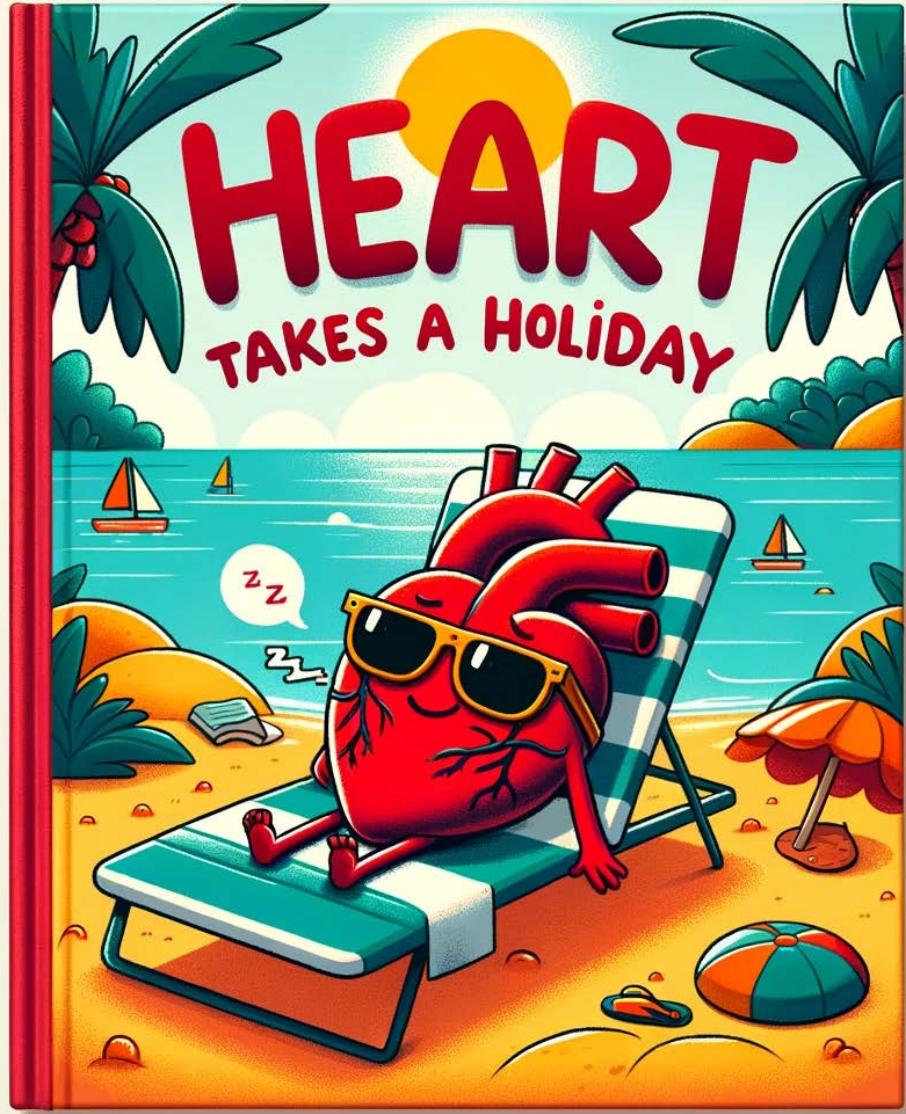
J. Allan Hobson, 2005, Nature



SCHLAF IST EIN GRUNDPFEILER DER HERZ-GESUNDHEIT – ABER NICHT NUR DIE MENGE ZÄHLT



Lloyd-Jones et al., Circulation, 2022
American Heart Association₉

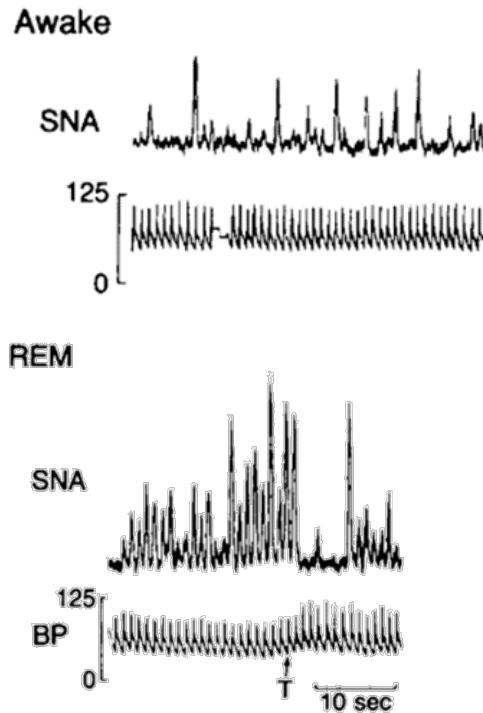


«[...] sleep is a period of cardiovascular quiescence, a state that, as we have noted, has been referred to as a, ‘cardiovascular holiday’.”

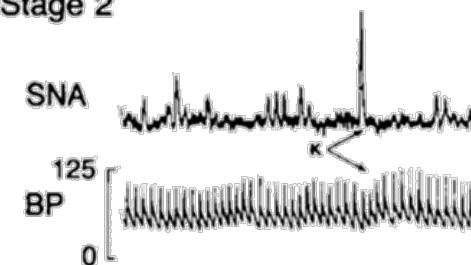
Trinder et al., Pflugers Arch – Eur j Physiol, 2012

DAS AUTONOME NERVENSYSTEM WÄHREND DES SCHLAFES

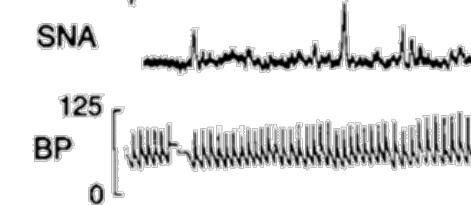
Sympathetische Aktivität



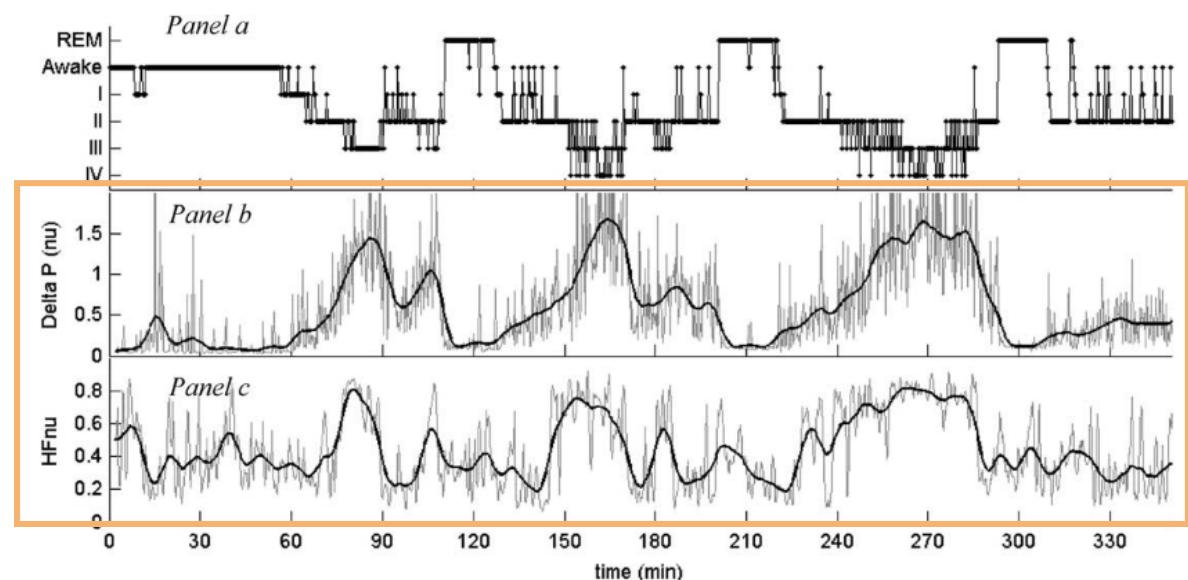
Stage 2



Stage 3

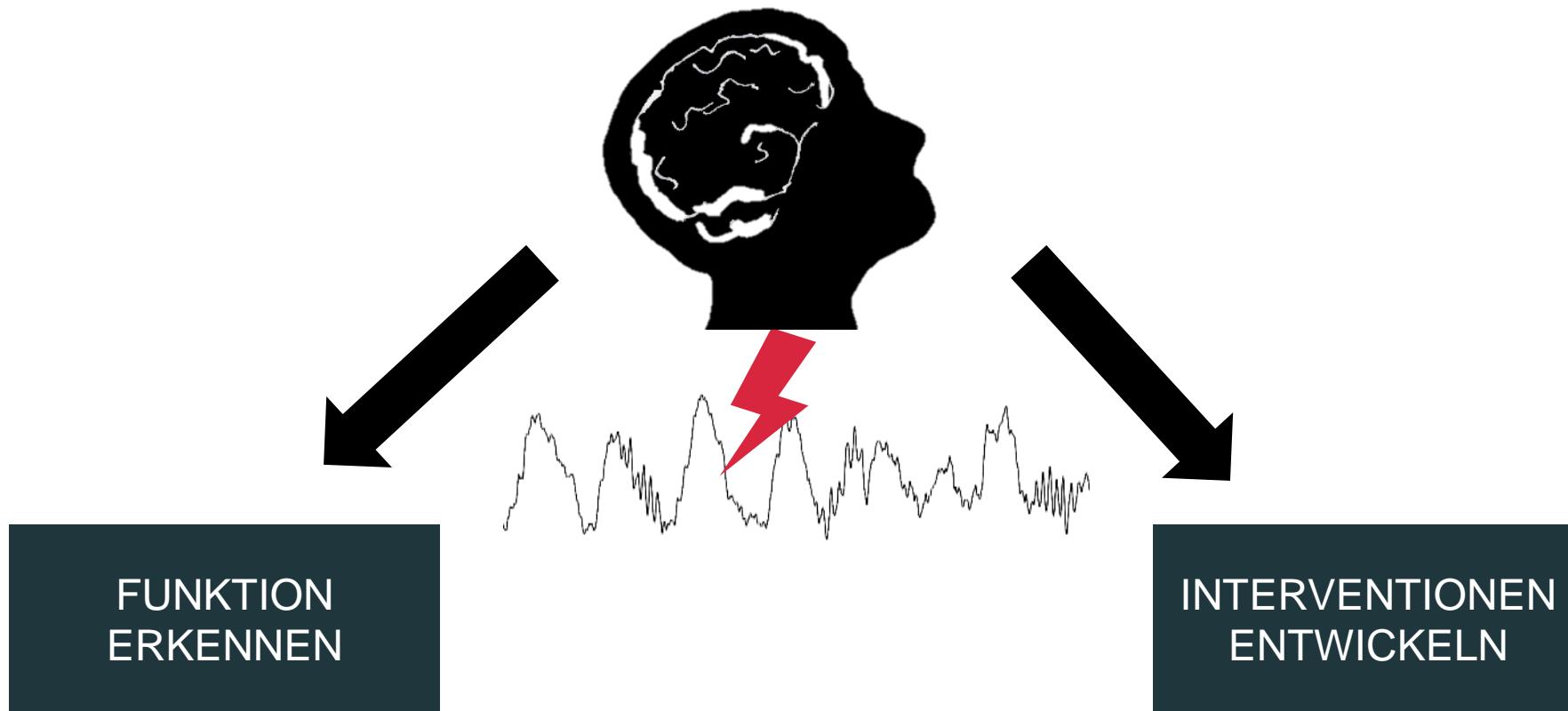


Parasympathetische Aktivität

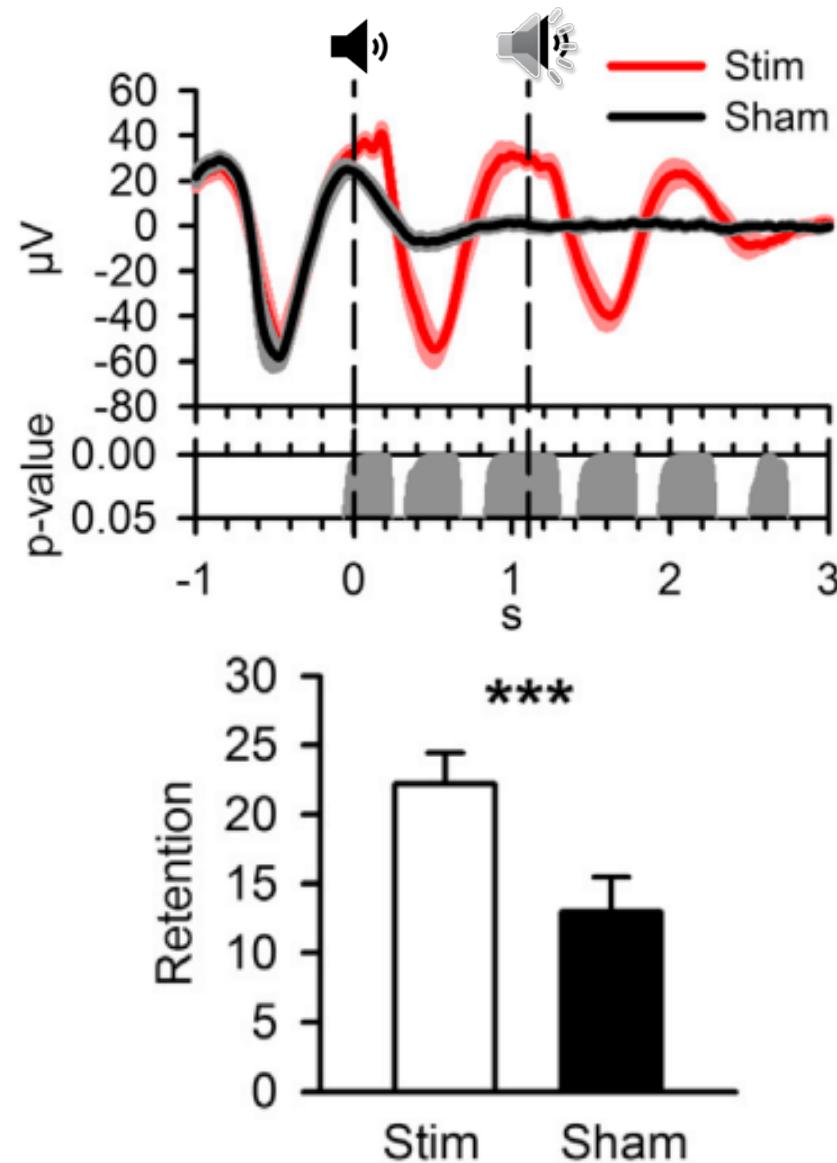


Somers et al., NEJM, 1993 | Jurysta et al., Clinical Neurophysiology, 2003

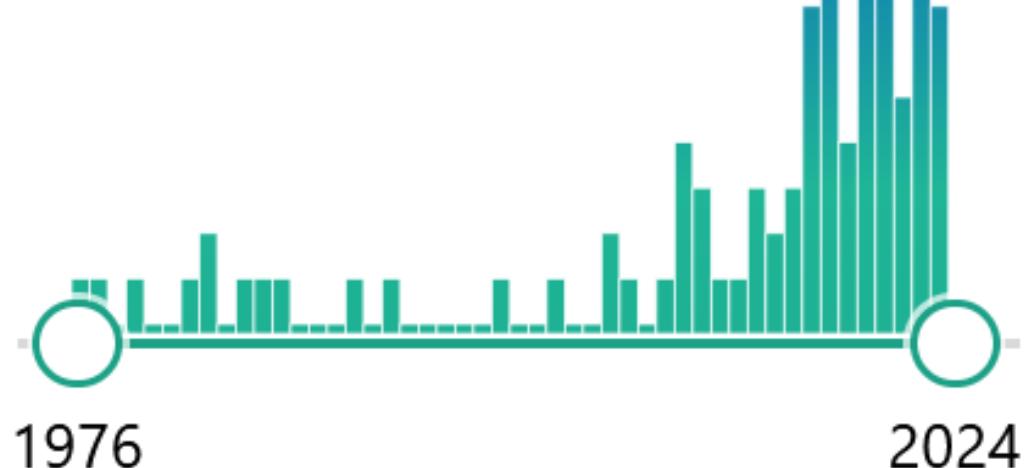
ABER GIBT ES AUCH EINEN FUNKTIONALEN ZUSAMMENHANG?



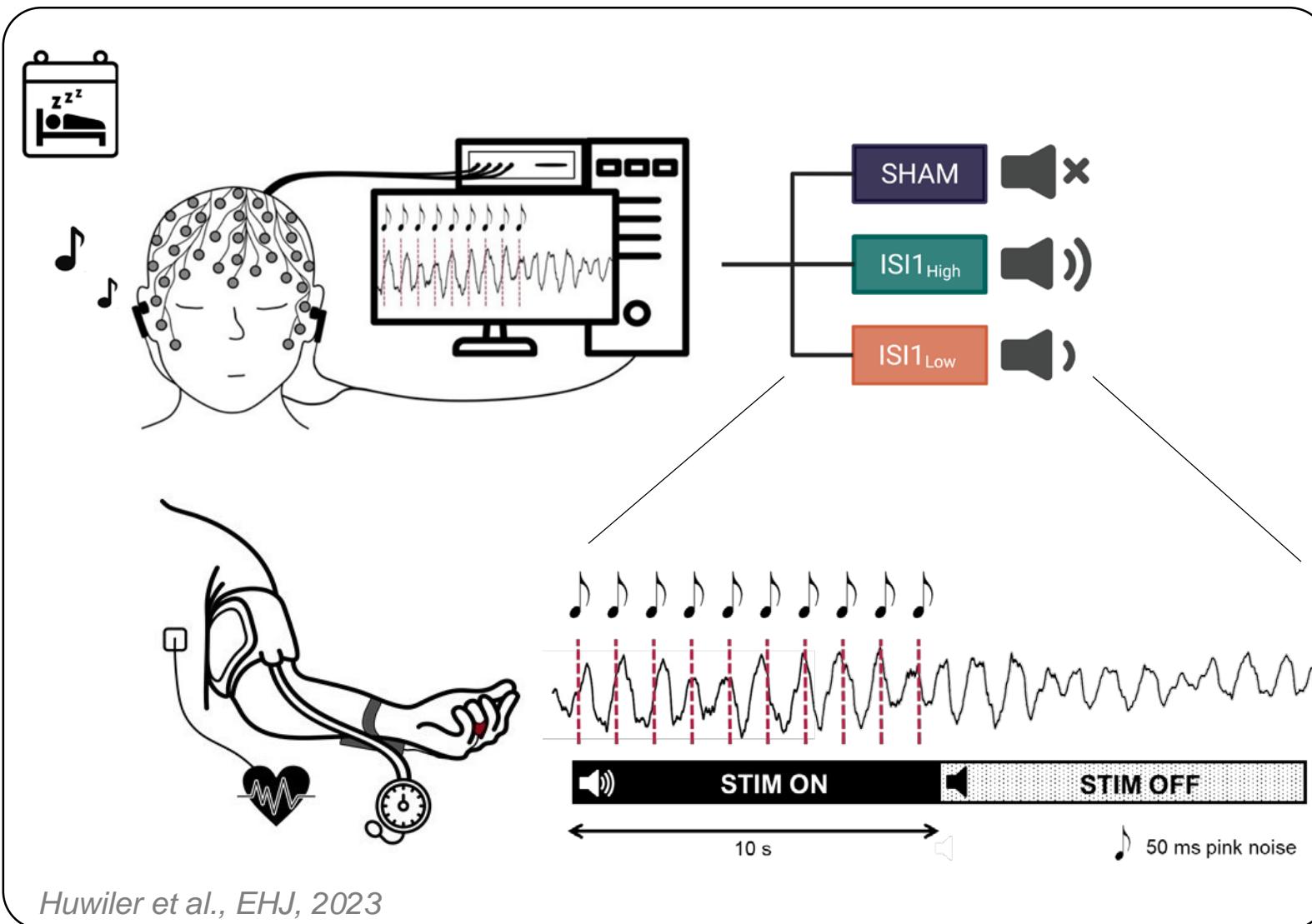
SCHLAFMODULATION MITTELS AUDITORISCHER STIMULATION



Ngo et al., *Neuron*, 2013

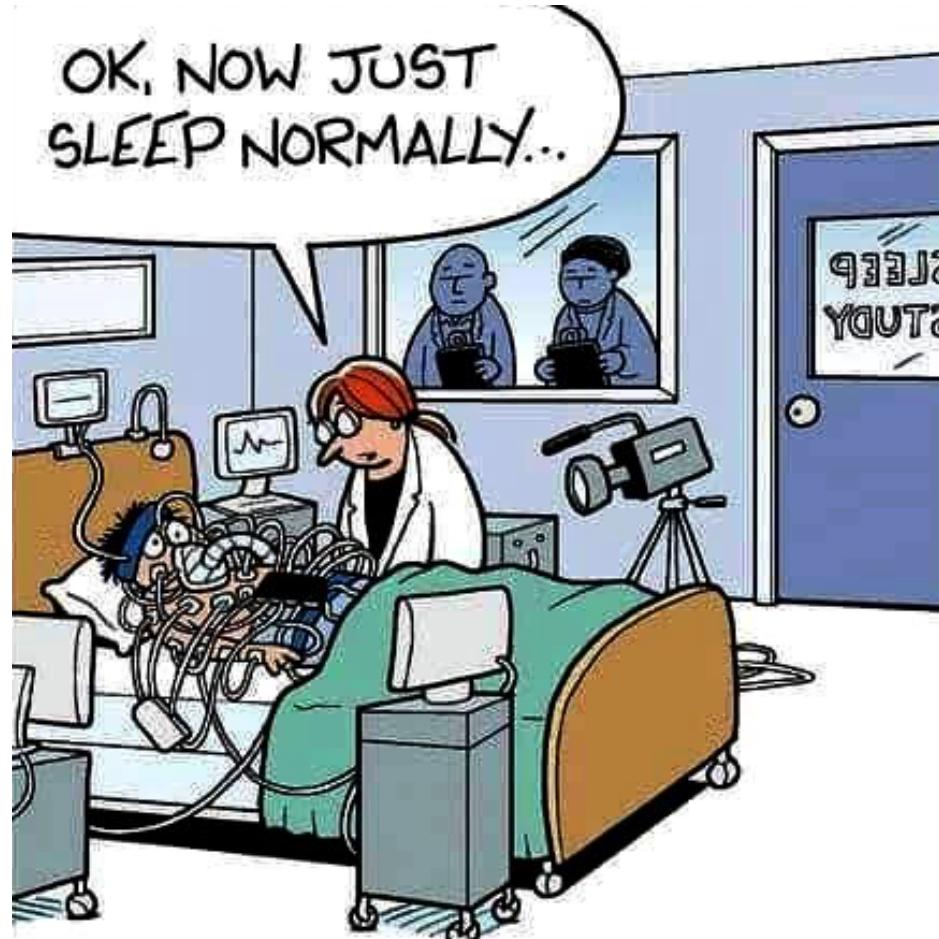
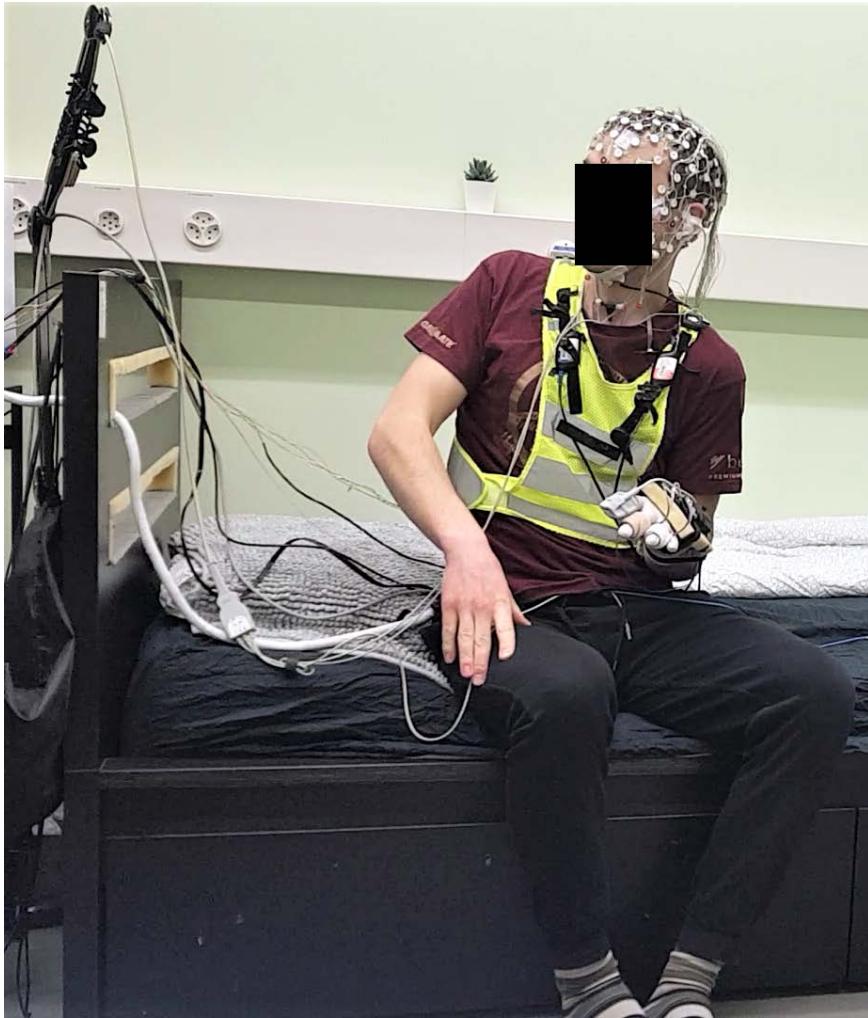


ABLAUF UNSERER SCHLAFSTUDIE



N = 18
30 – 57 Jahre

OK, UND JETZT SCHLAF GANZ NORMAL...



Stephanie
Huwiler

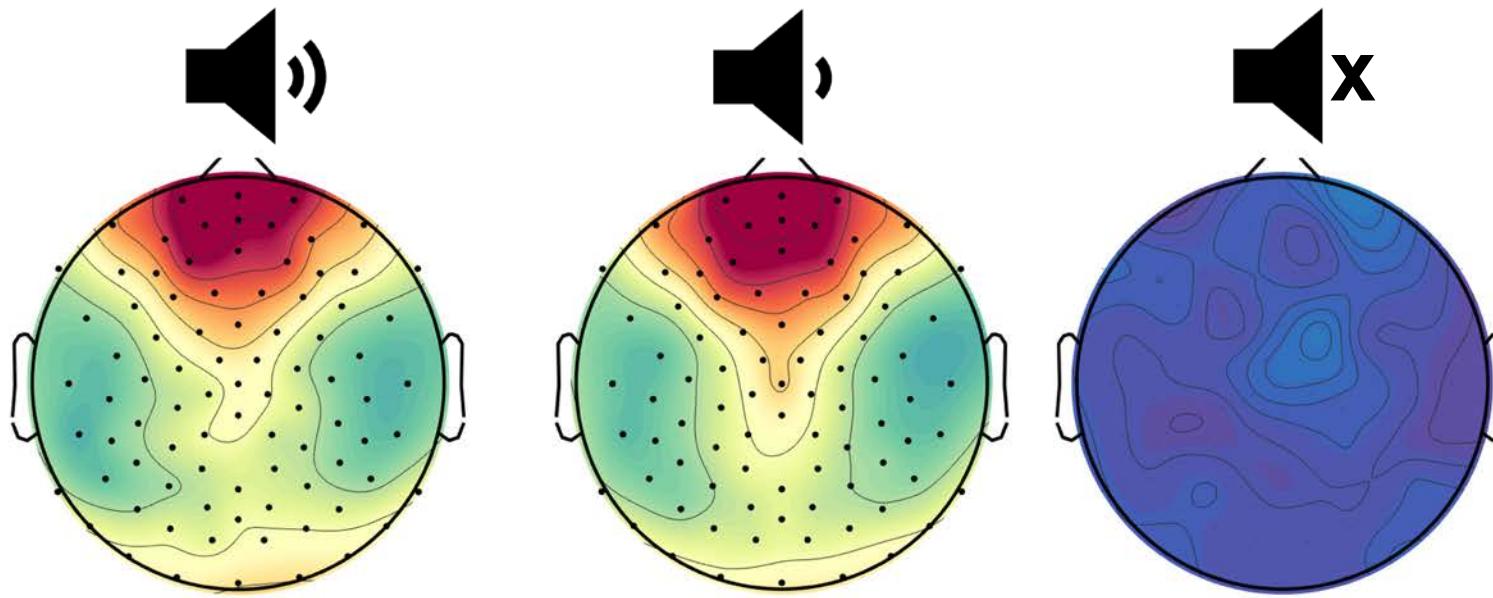
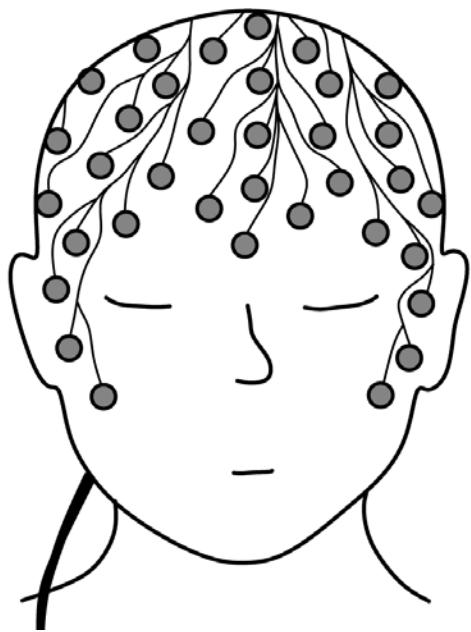


Manuel Carro
Dominguez



Giulia
Alessandrelli

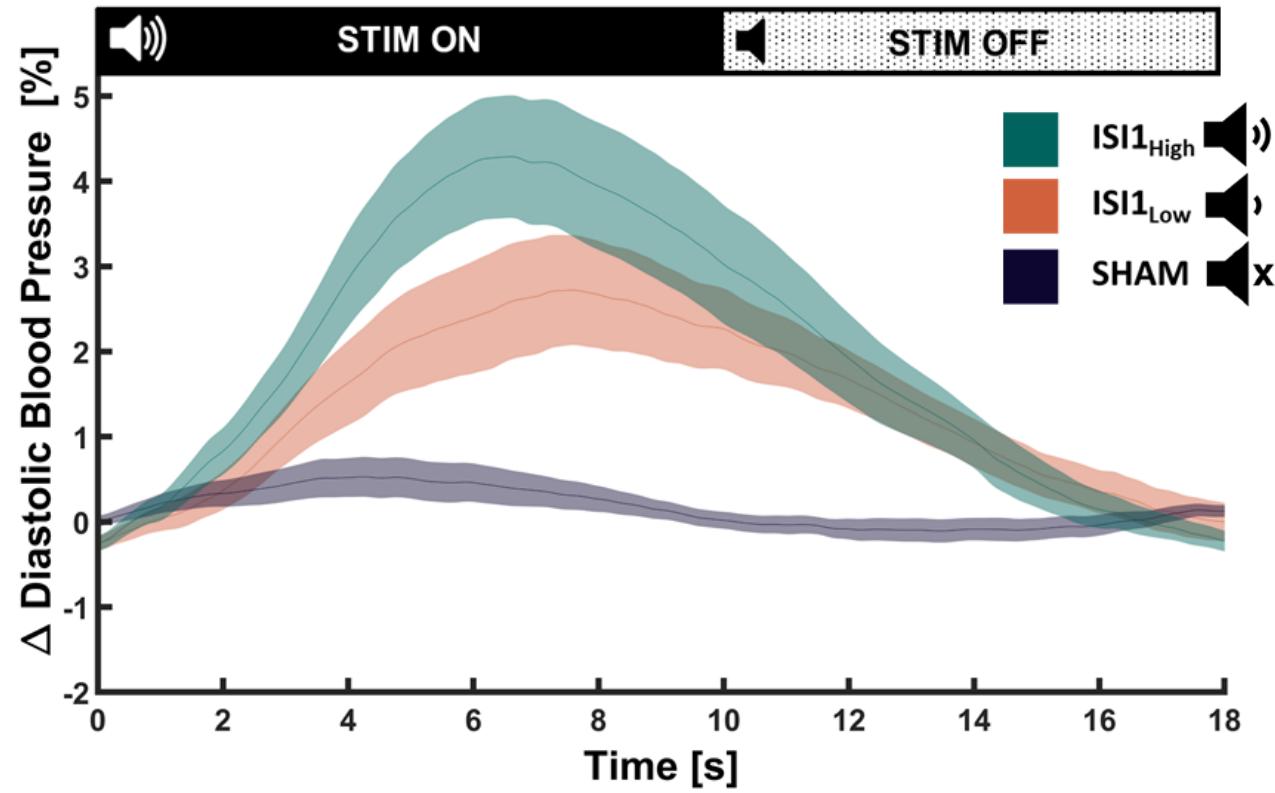
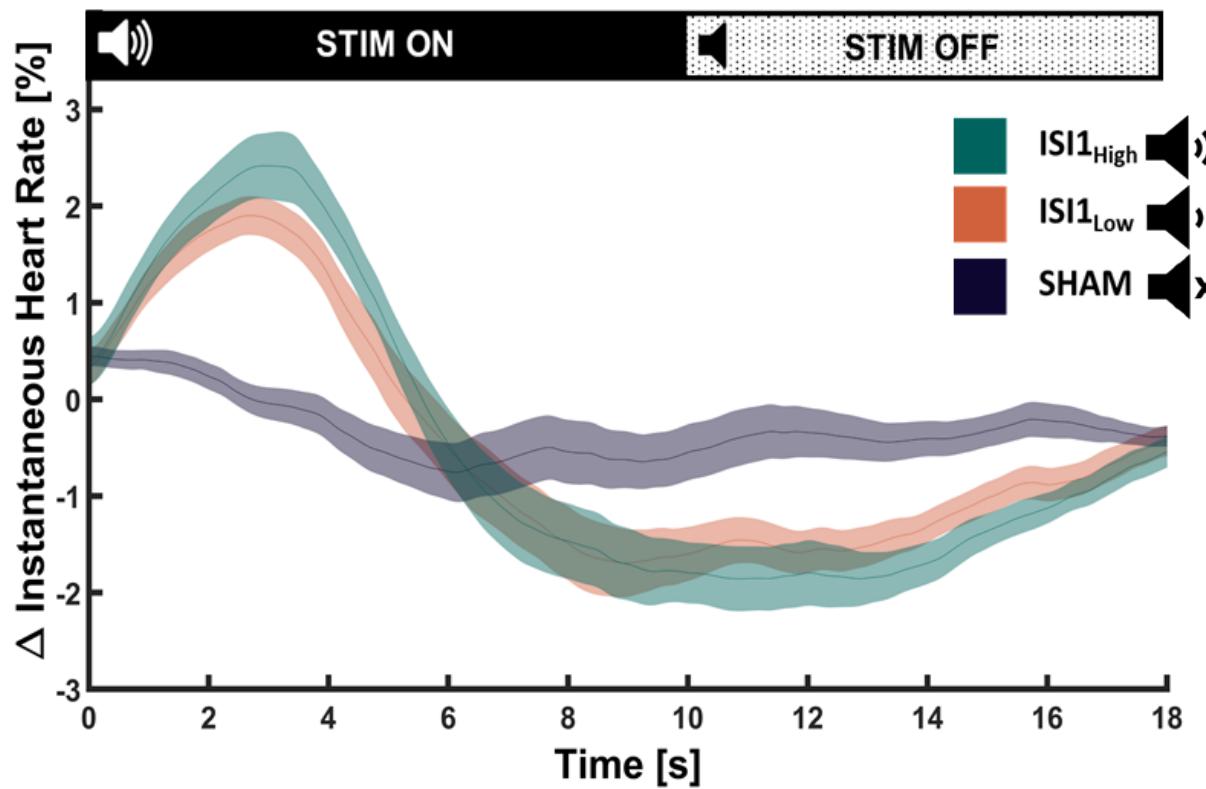
TIEFSCHLAFWELLEN WERDEN DURCH BEIDE STIMULATIONEN ERHÖHT



Induzierte Tiefschlafaktivität [$\mu\text{V}^2/\text{Hz}$]

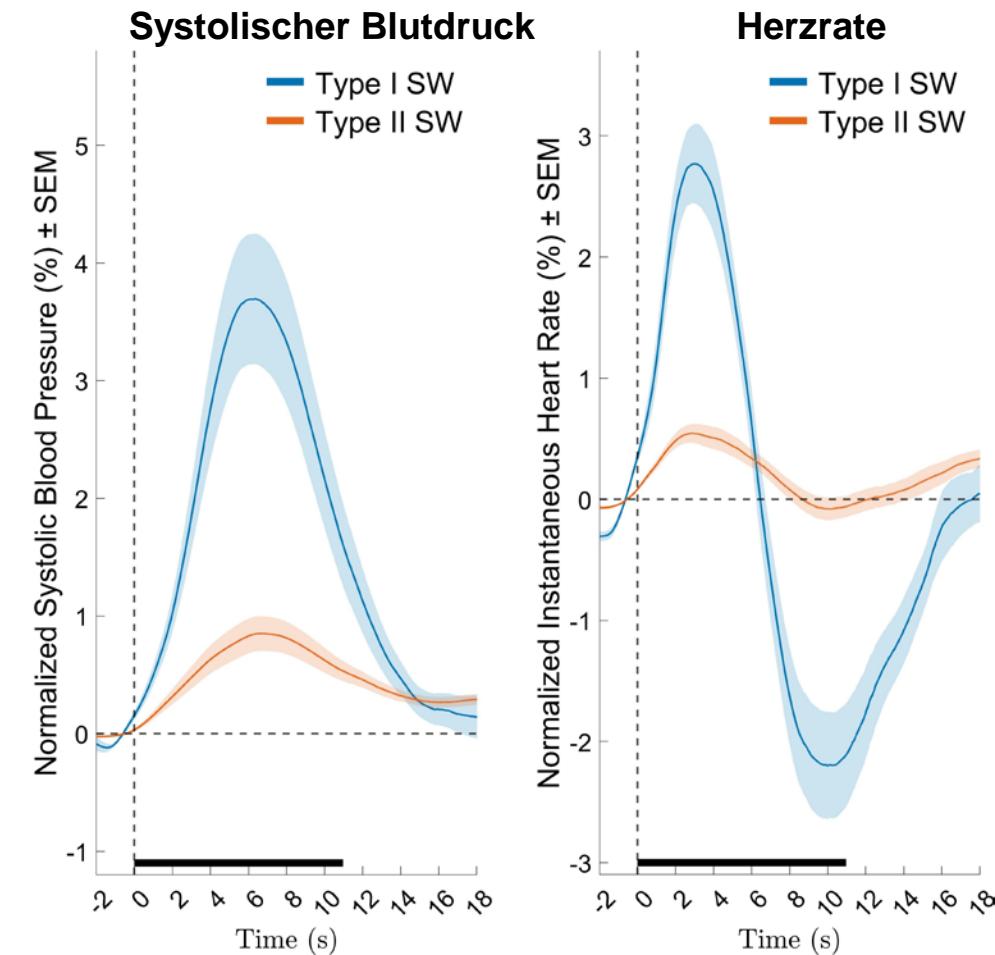
Huwiler et al., EHJ, 2023

AUDITORISCHE STIMULATION INDUZIERT KARDIOVASKULÄRE PULSATIONEN



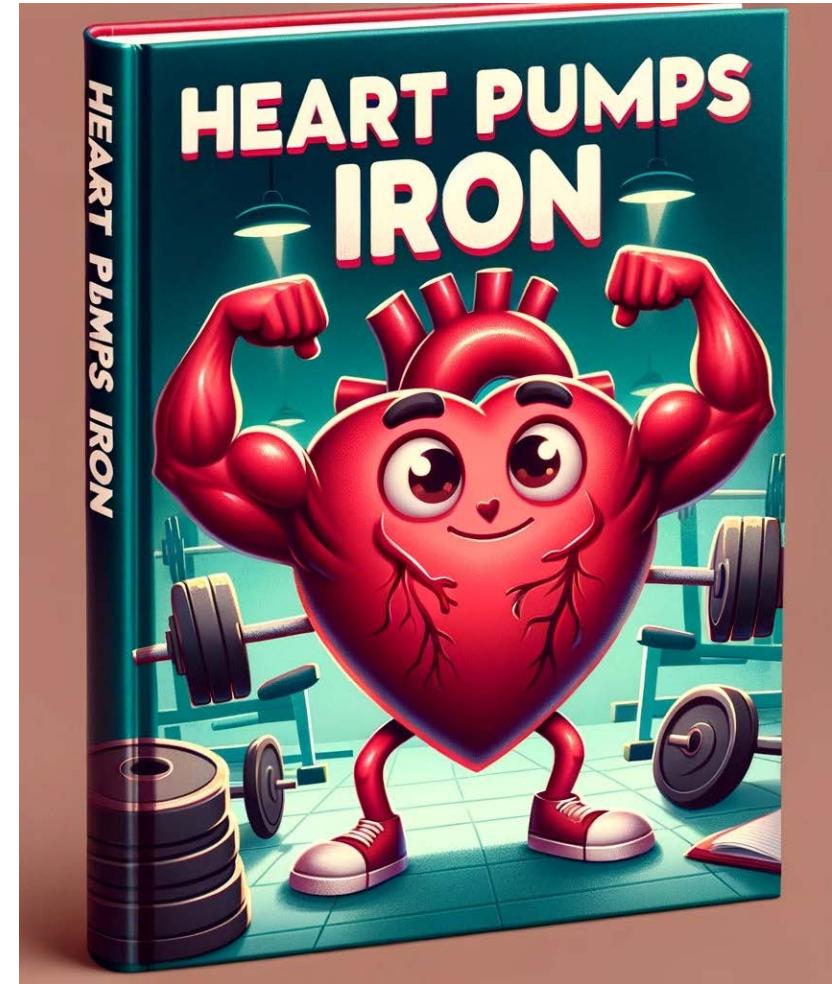
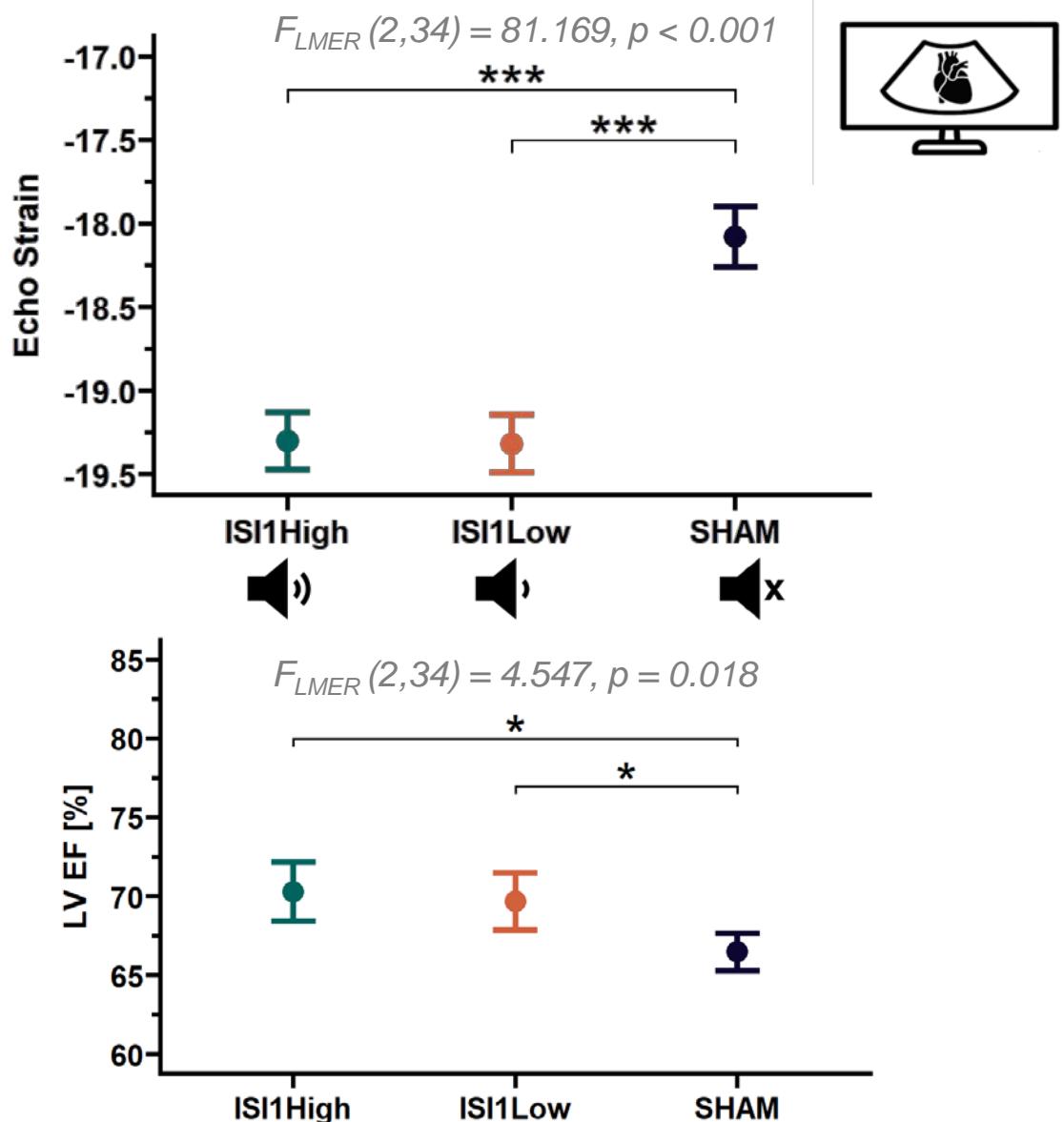
Huwiler et al., EHJ, 2023

VOR ALLEM AUSGEPRÄgte TIEFSCHLAFWELLEN SIND DAFÜR VERANTWORTLICH



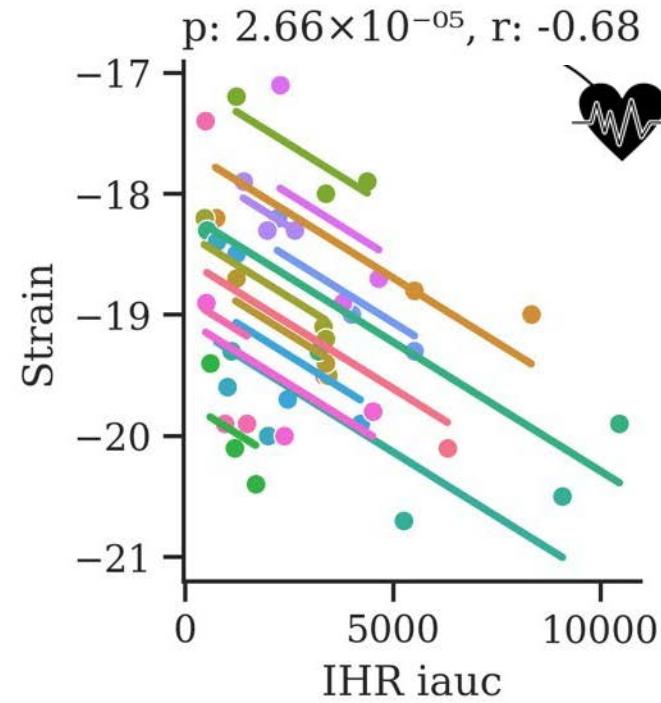
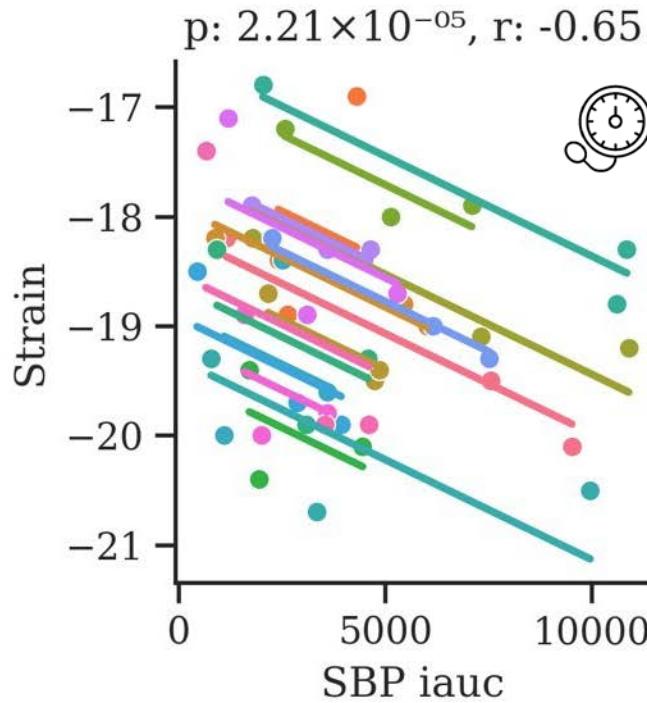
Alessandrelli et al., in preparation

STIMULATION VERBESSERT DIE LV SYSTOLISCHE FUNKTION



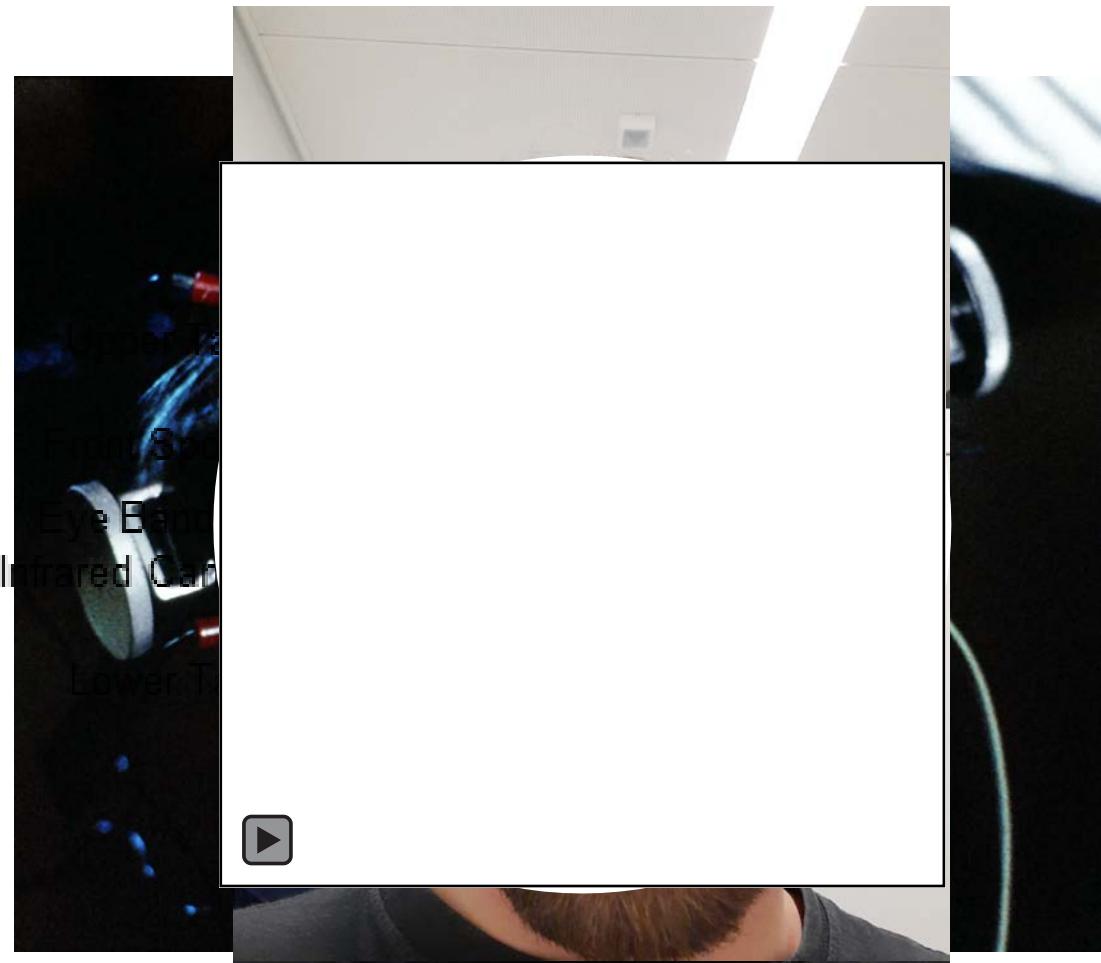
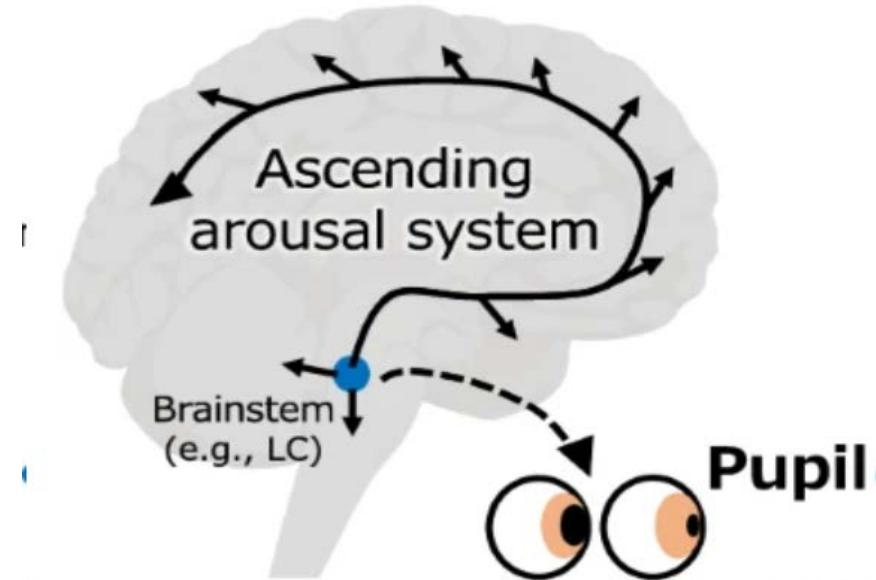
Huwiler et al., EHJ, 2023

STÄRKE DER PULSATION SAGT HERZFUNKTION NACH DEM SCHLAF VORAUS



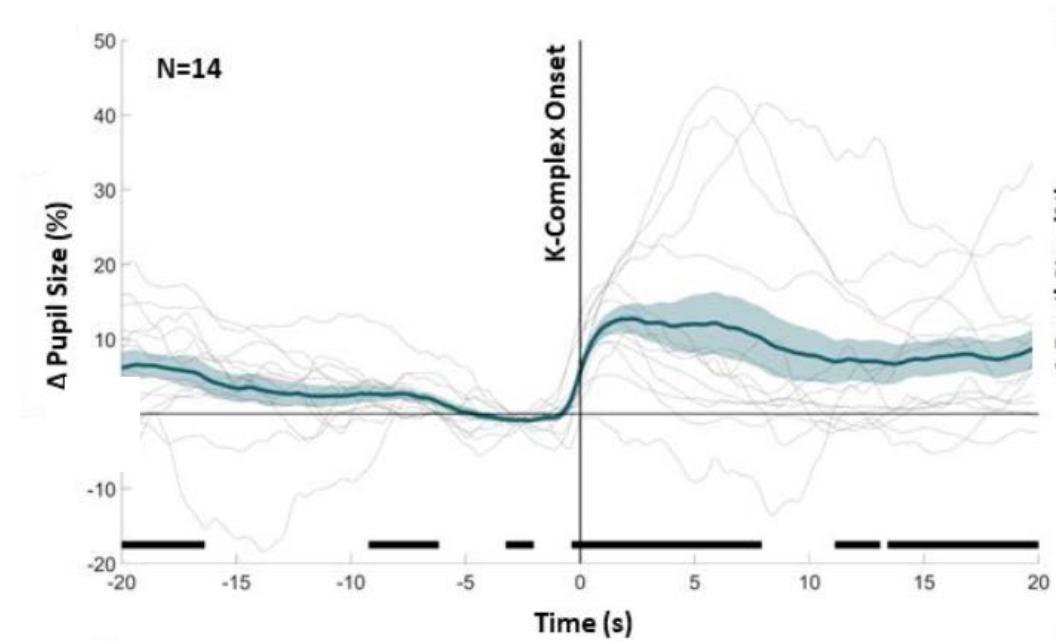
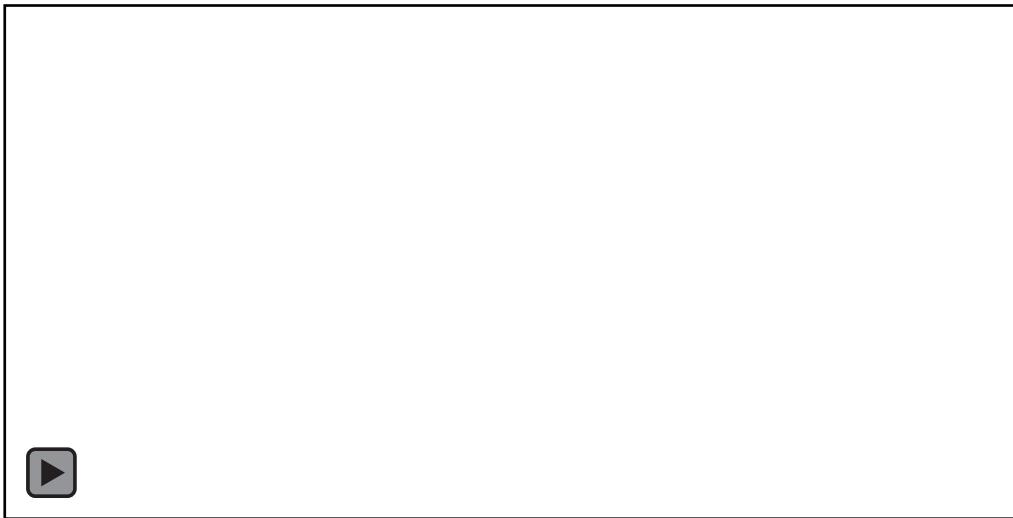
Alessandrelli et al., in preparation

DIE PUPILLE ALS FENSTER ZUM GEHIRN



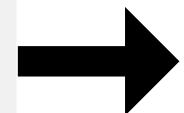
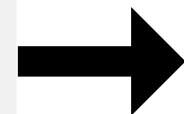
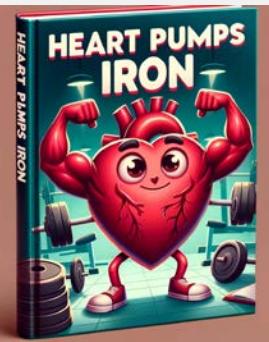
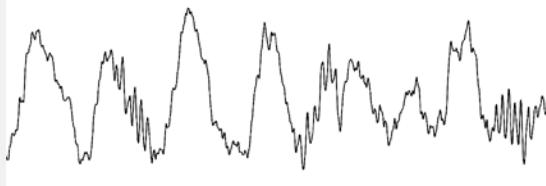
Carroll, Donnelly, Burgess et al., *Biophys. J.*, 1971

PUPILLENAKTIVIERUNG WÄHREND STIMULATION UND TIEFSCHLAFWELLEN



Carro-Dominguez et al., BioRxiv, 2023

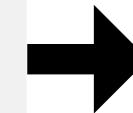
HILFT UNS TIEFSCHLAFSTIMULATION HERZ- UND GEHIRNGESUNGHEIT ZU FÖRDERN?



Prävention/Therapie für kardiovaskuläre Erkrankung?



Prävention für Alzheimer Erkrankung?



Langzeitinterventionen in verschiedenen Populationen sind wichtig, um das Potential der auditorischen Tiefschlafstimulation zu verstehen



Ferster, Lustenberger, Karlen,
IEEE Sens. Lett., 2019

DANKSAGUNG

ETH Zurich

NCM Lab

Stephanie Huwil
Manuel Carro Do
Giulia Alessandr
Nicole Wenderot
Fabia Stich
Rossella Sala
Florent Aziri
Anna Trippel
Lily Laubscher
Gloria Stoll
Stella Oberlin
Timona Oesch

Exercise Physi

Christina Spengl

University Hopi

Cardiology

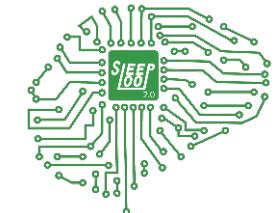
Christian Schmie
Susanne Marker
David Niedersee
Philipp Bohm
Tabea Ryf



FUNDING



[Hochschulmedizin Zürich](#)



CONTACT/INFORMATION

caroline.lustenberger@hest.ethz.ch

www.ncm.hest.ethz.ch

 @lustenca

