

Die funktionelle Magnetresonanztomographie

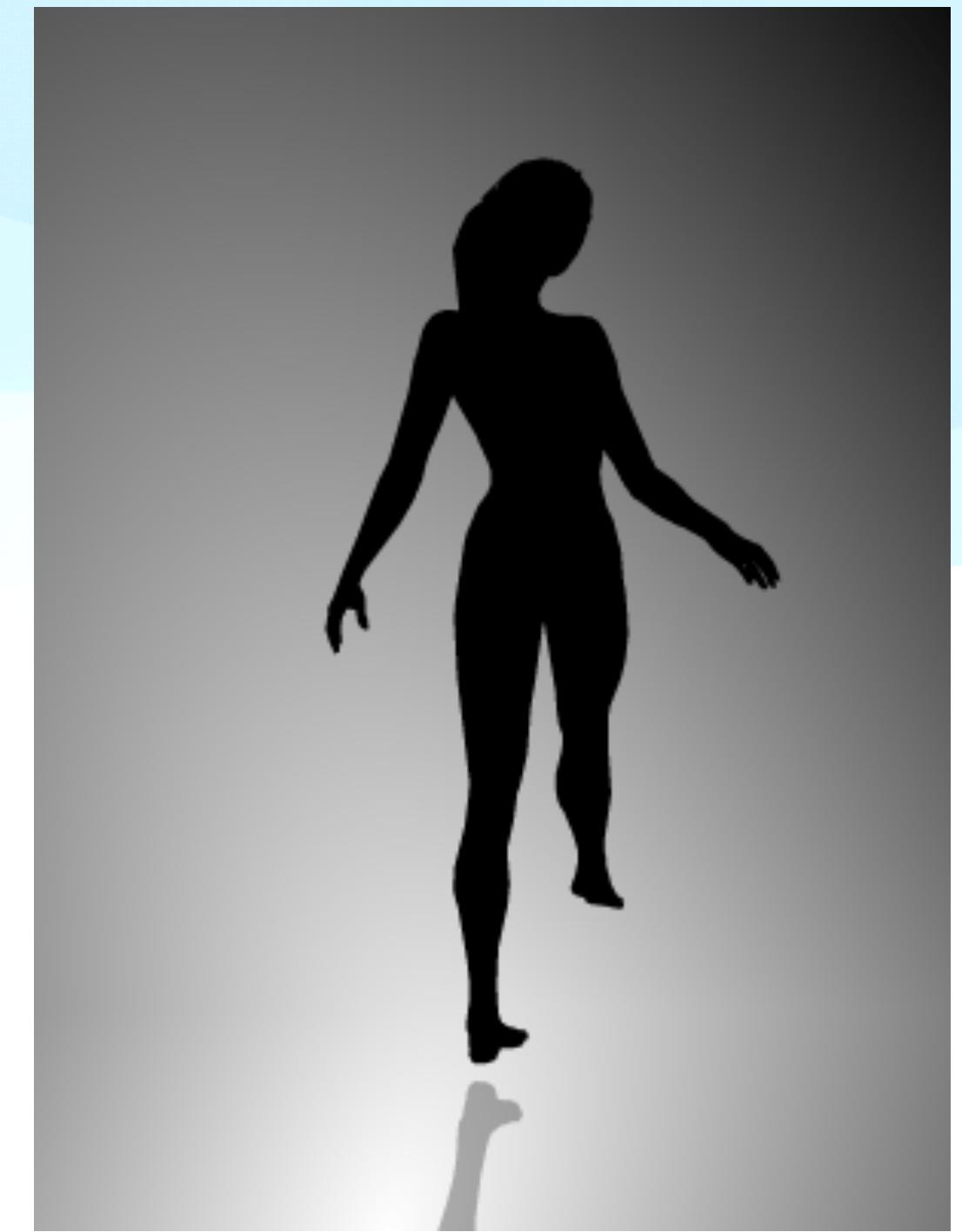
ein bildgebendes Verfahren

Dustin Maurer
28.06.2023









Gliederung

- Grundlagen der fMRT
- Technische Aspekte
- Datenanalyse
- Anwendungsgebiet
- Zusammenfassung & Ausblick
- MATLAB - Image Filtering non-linear

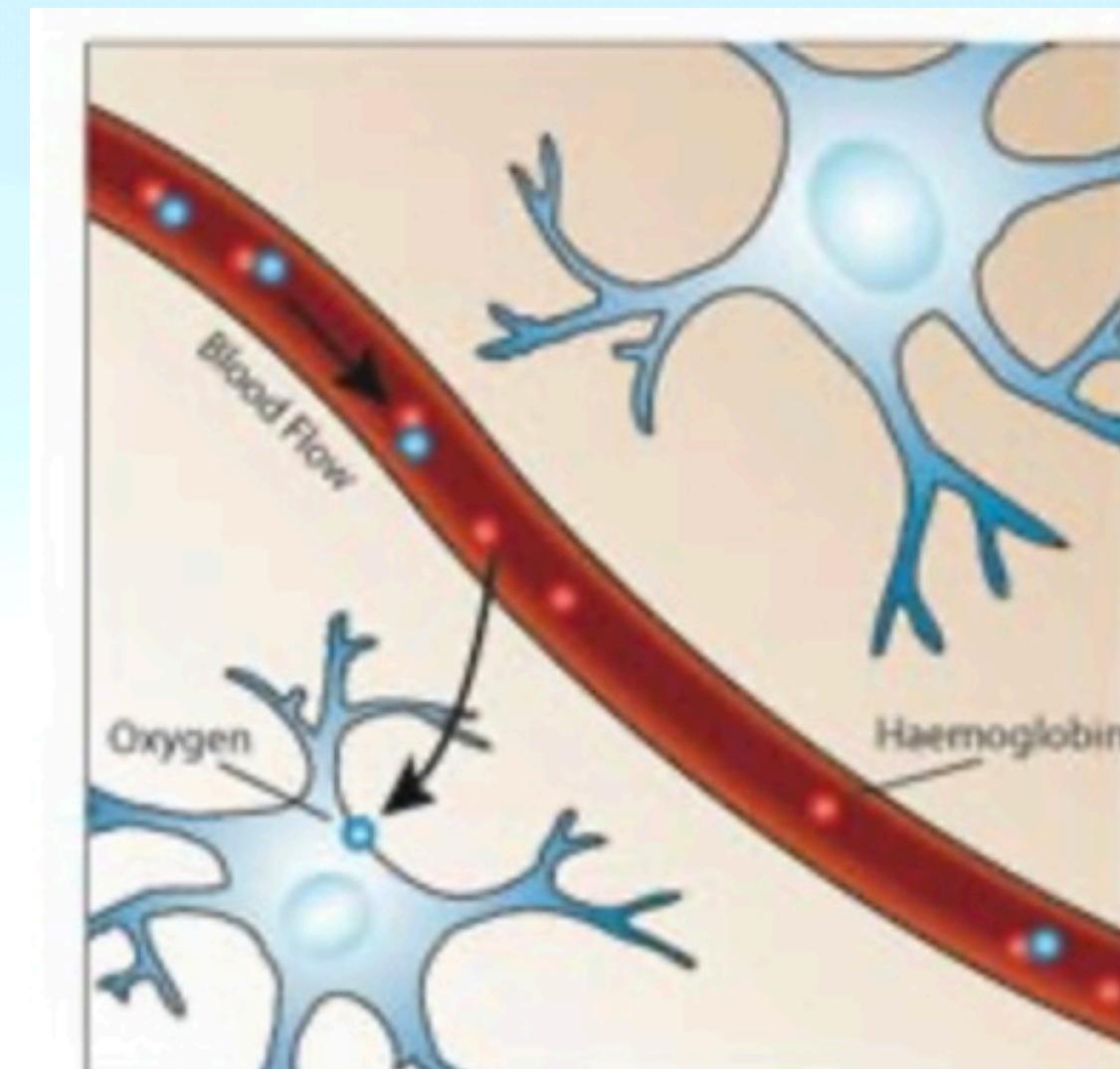
Grundlagen der fMRT



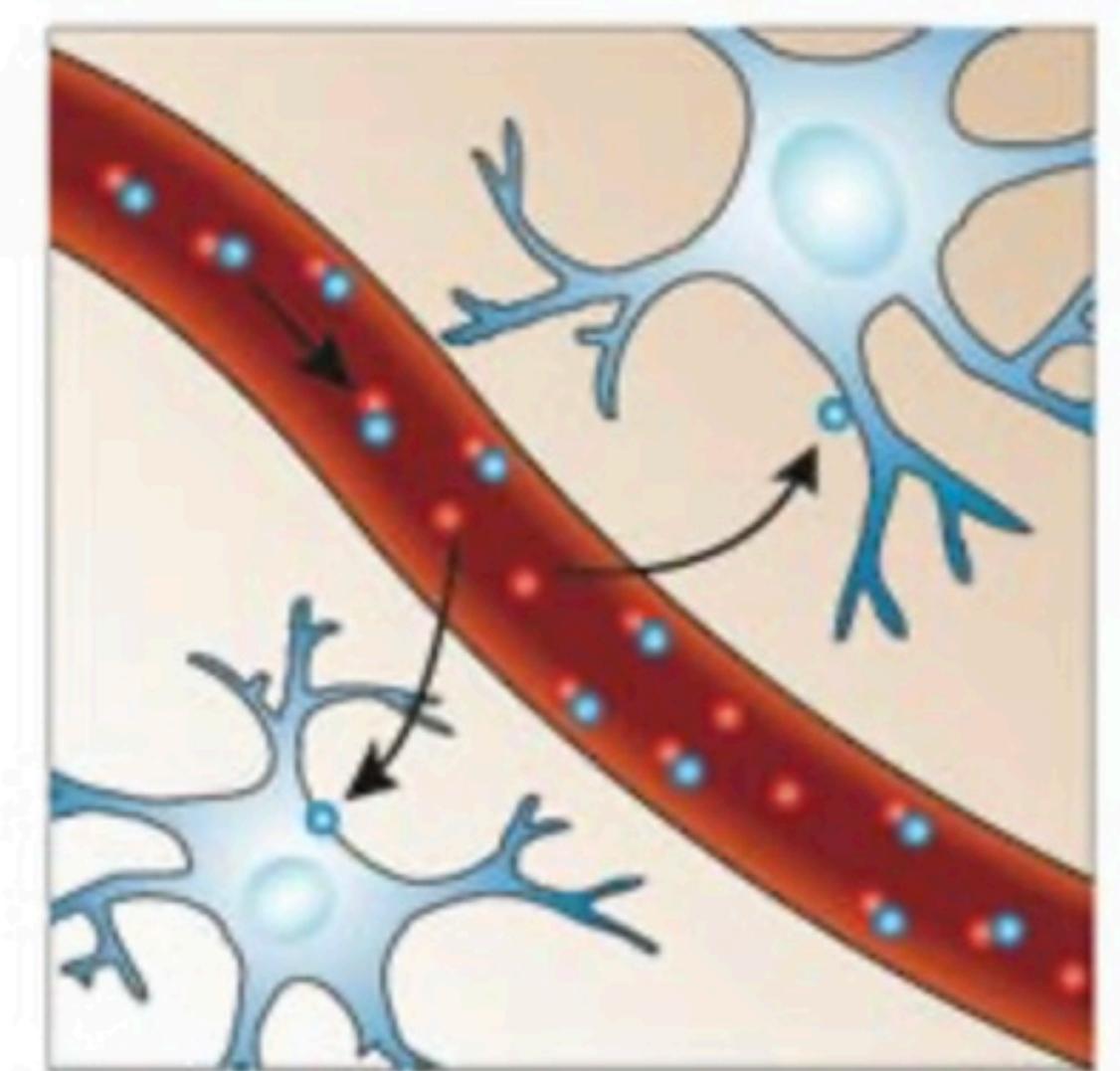
Grundlagen der fMRT



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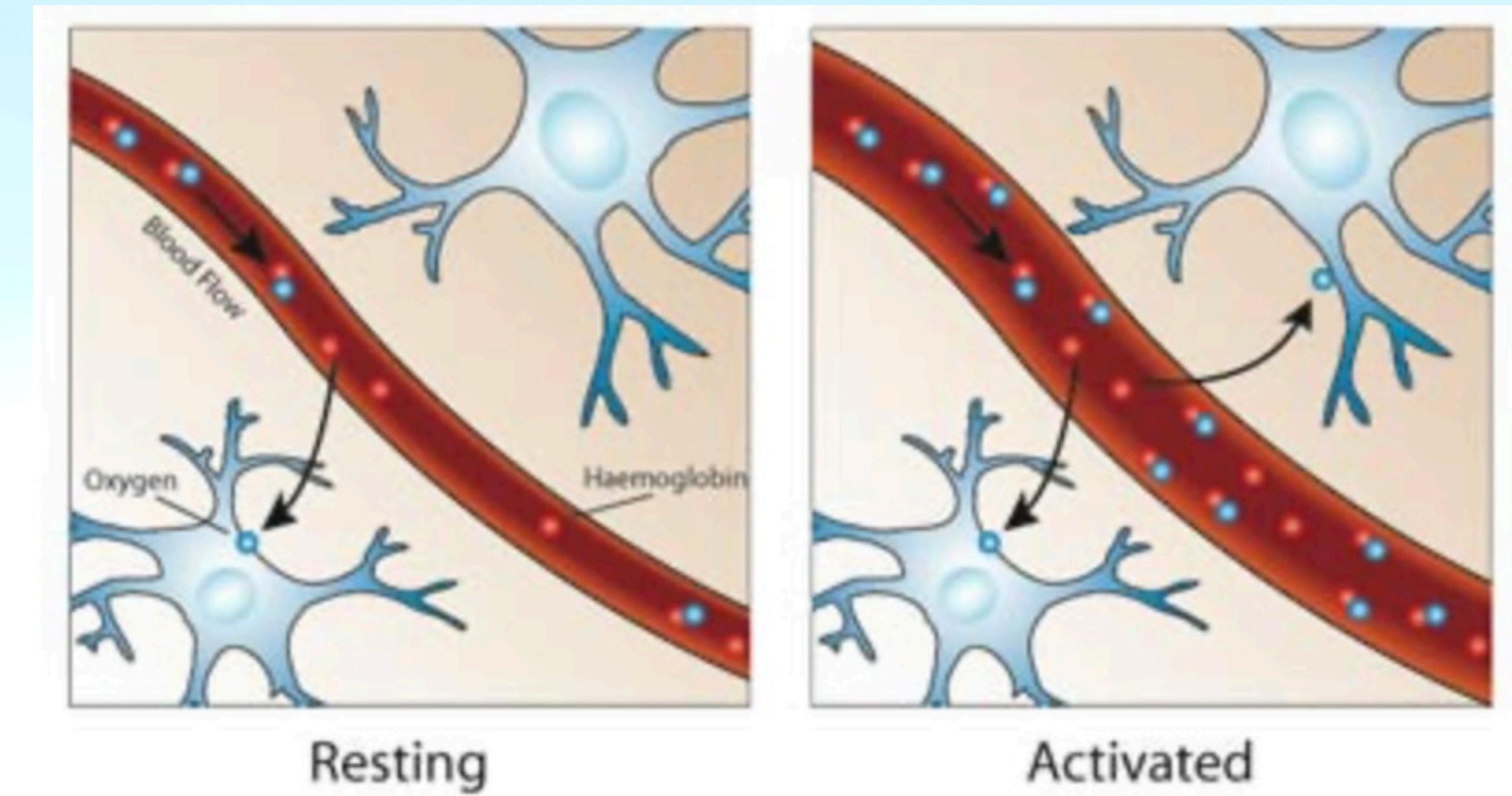


Resting

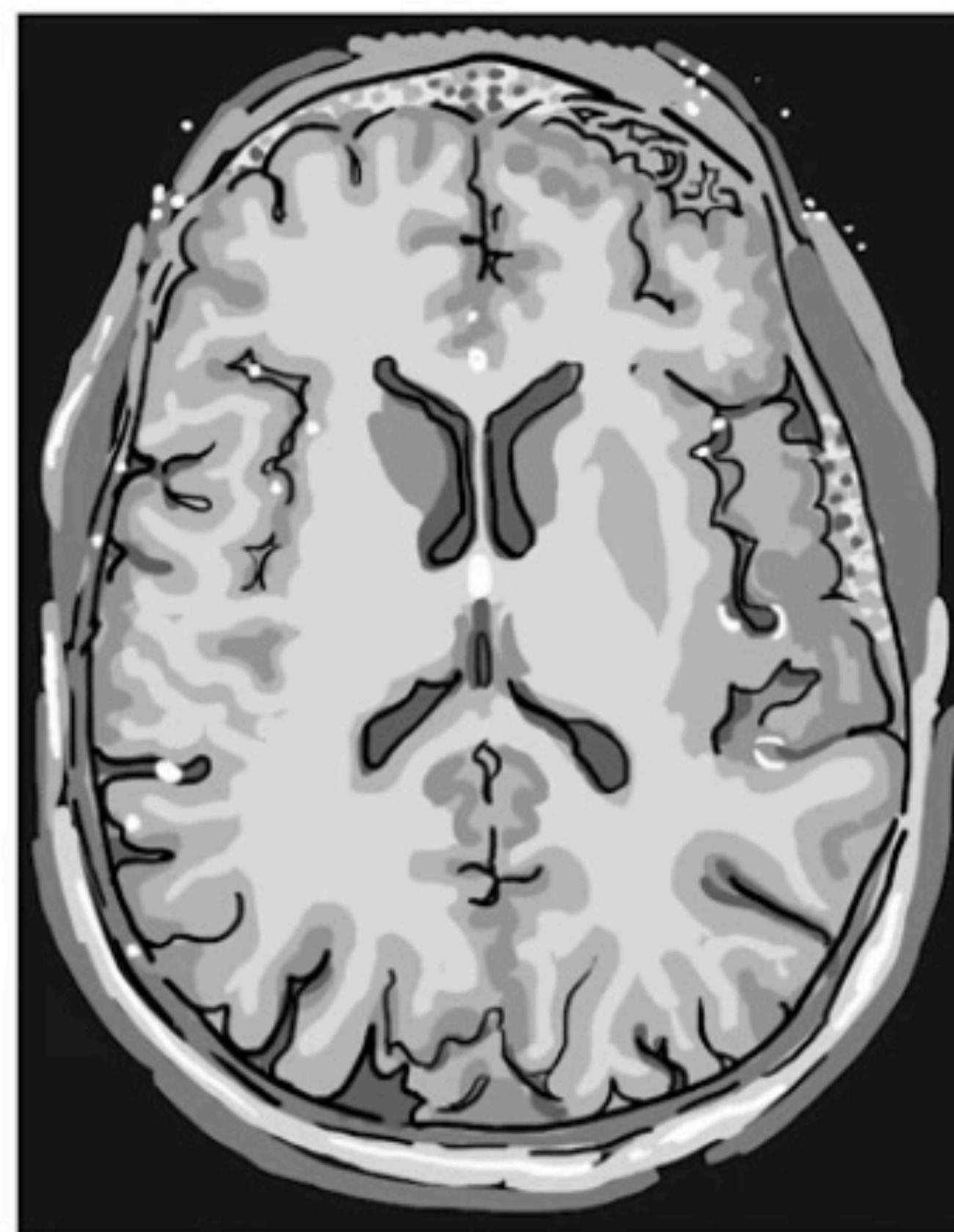


Activated

Grundlagen der fMRT

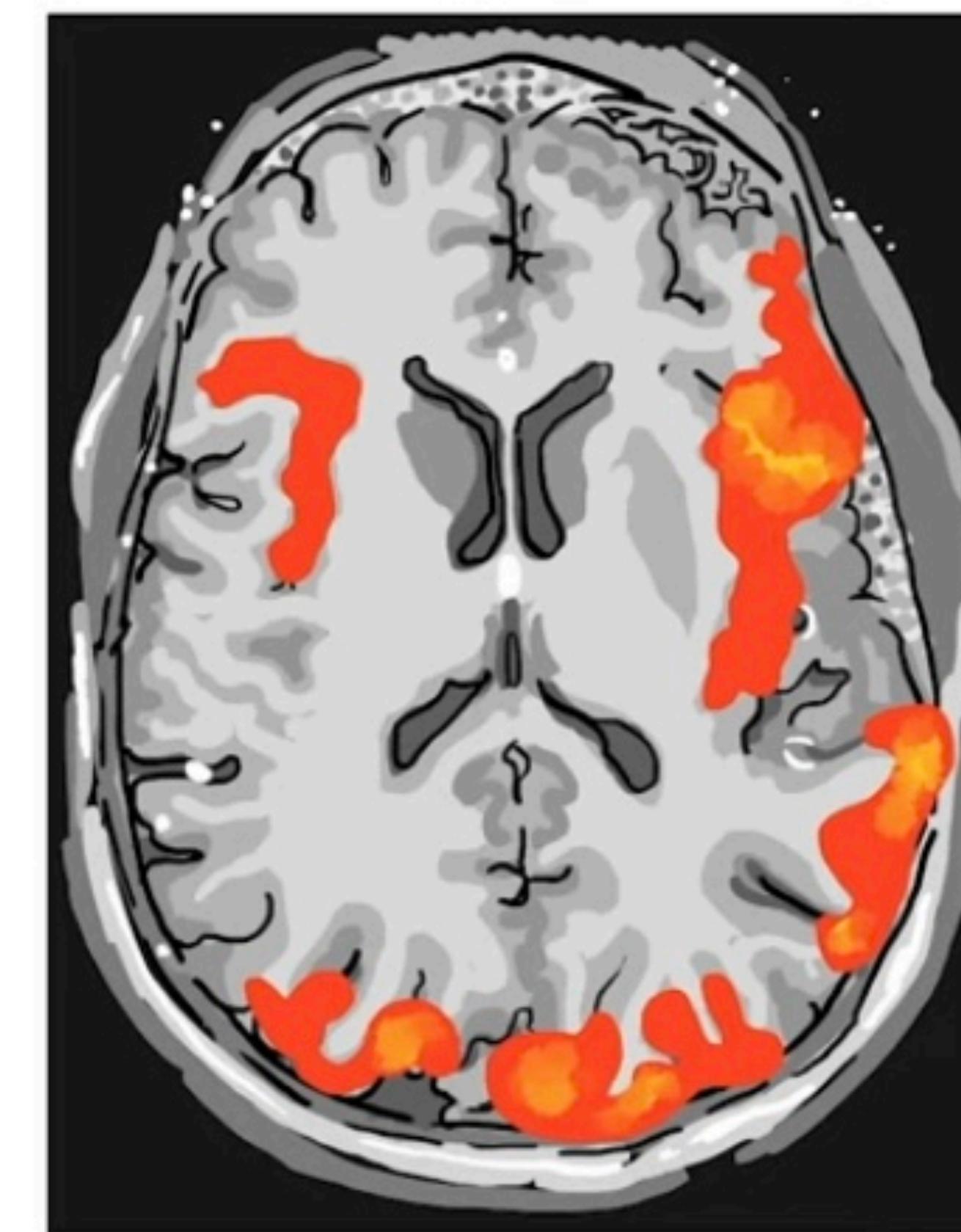


Structural MRI



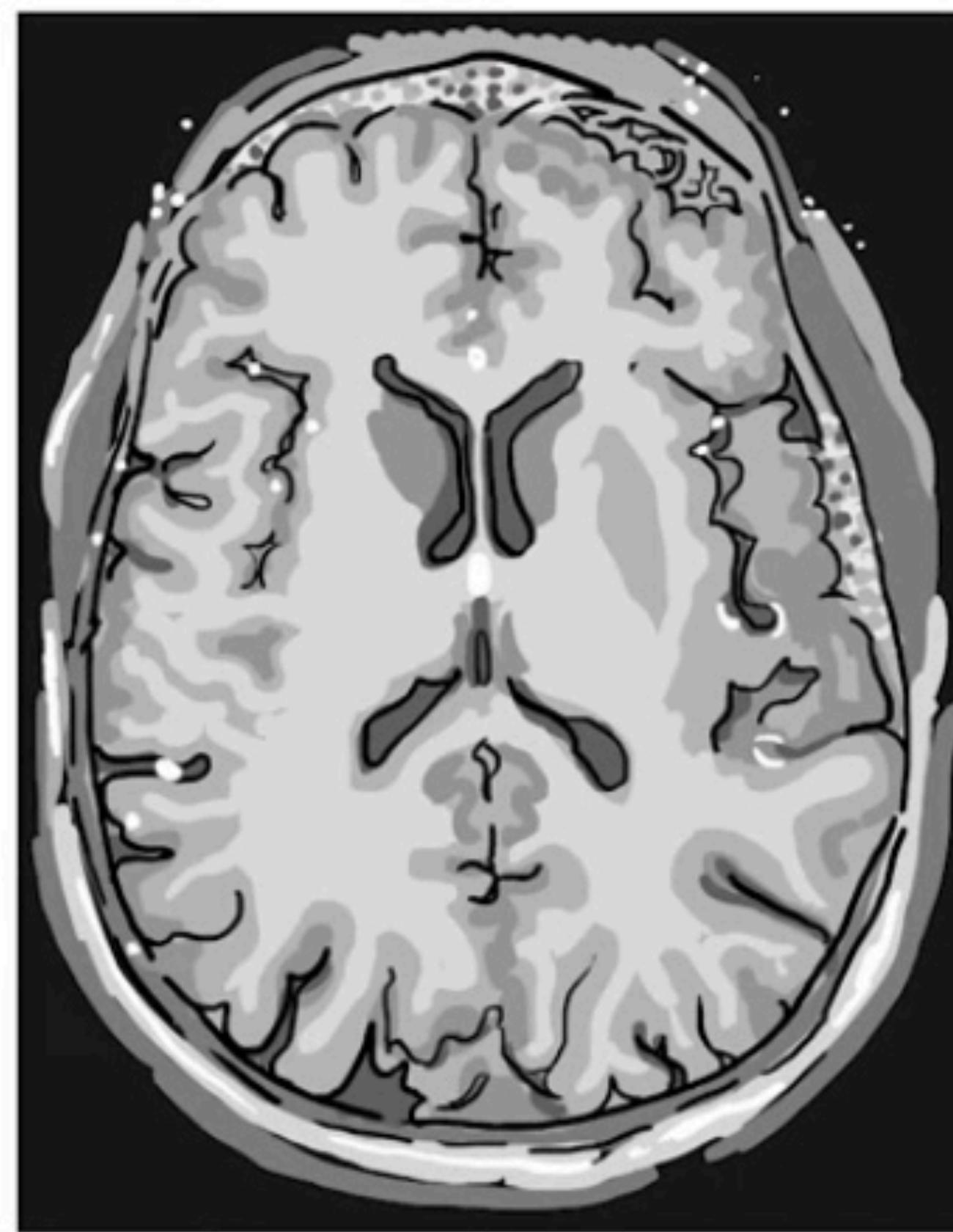
Brain Structure

Functional MRI



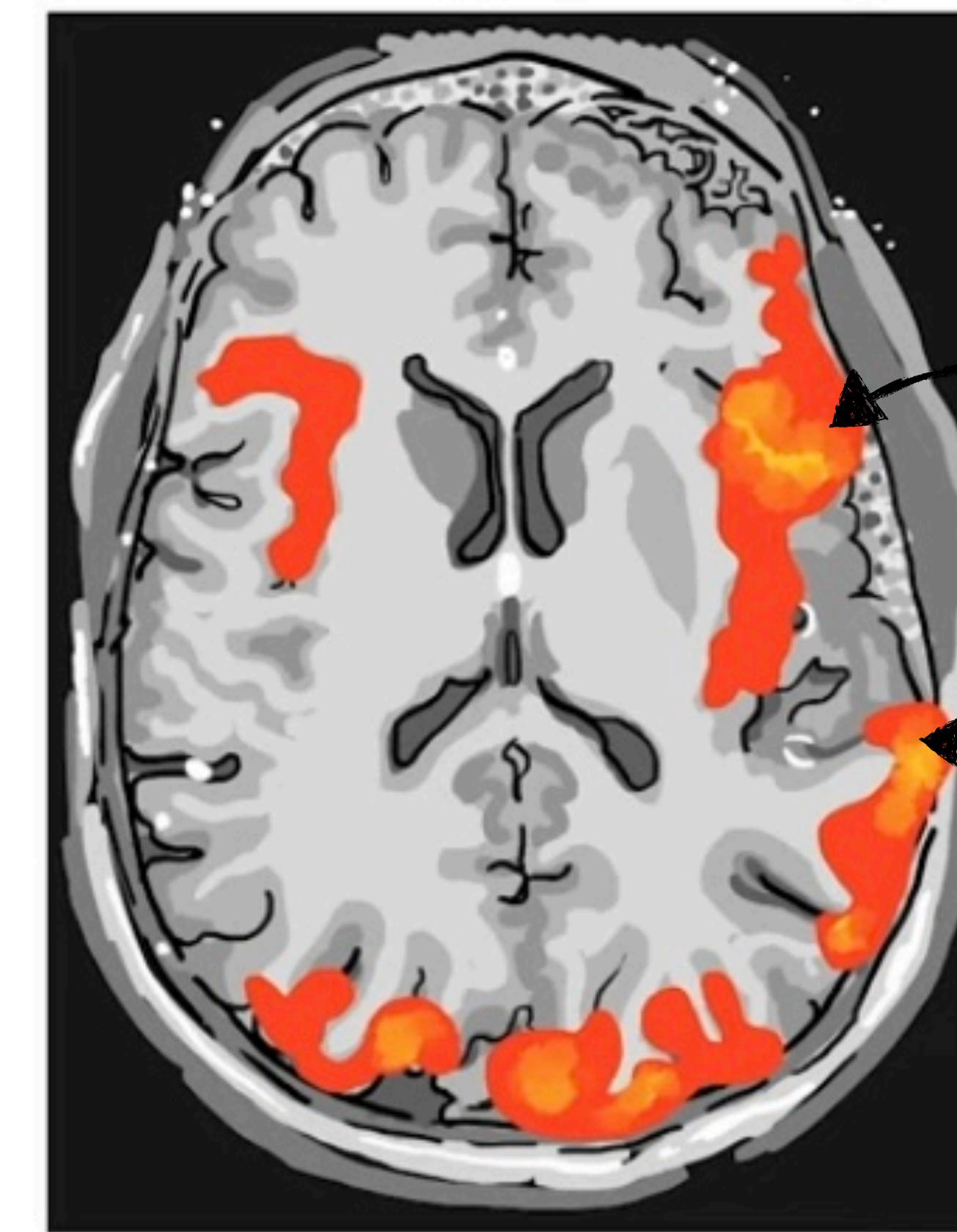
Brain Activity

Structural MRI



Brain Structure

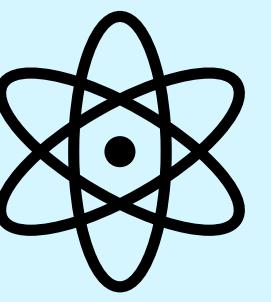
Functional MRI



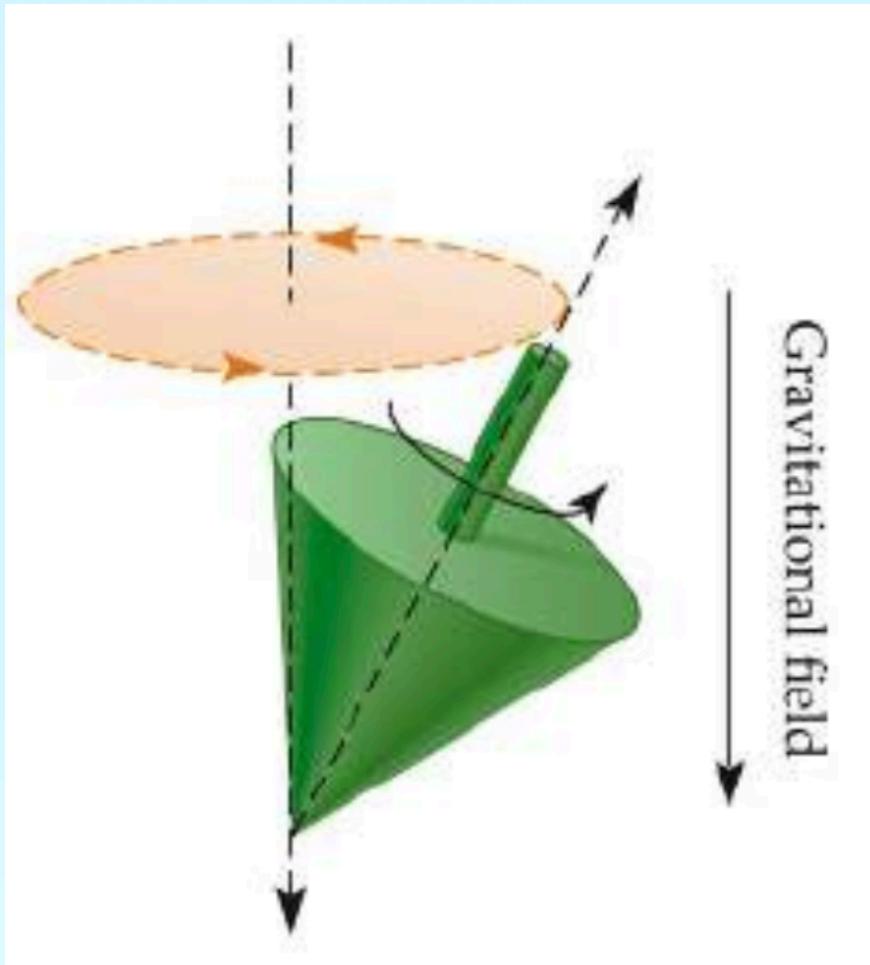
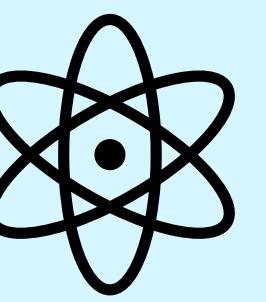
Brain Activity

active
areas

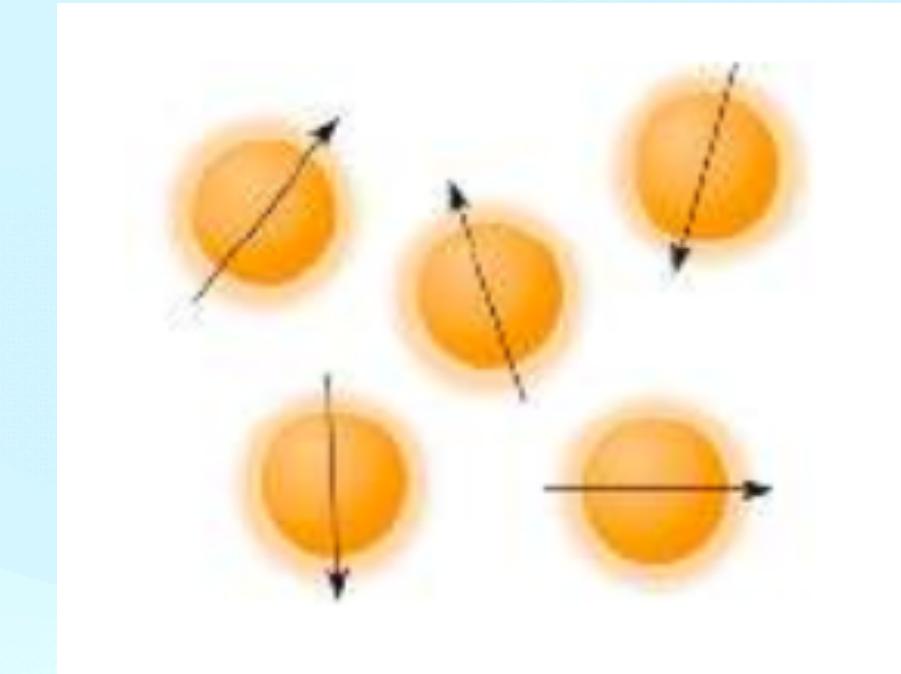
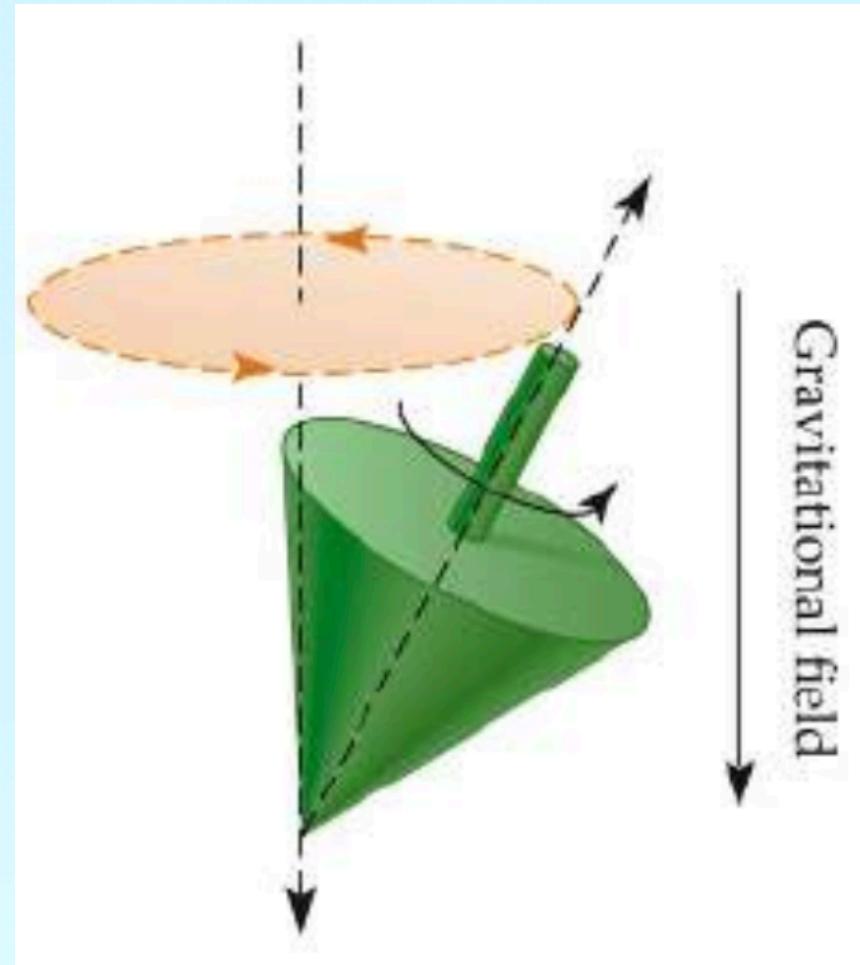
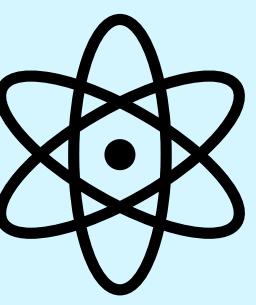
Physikalische Grundlagen



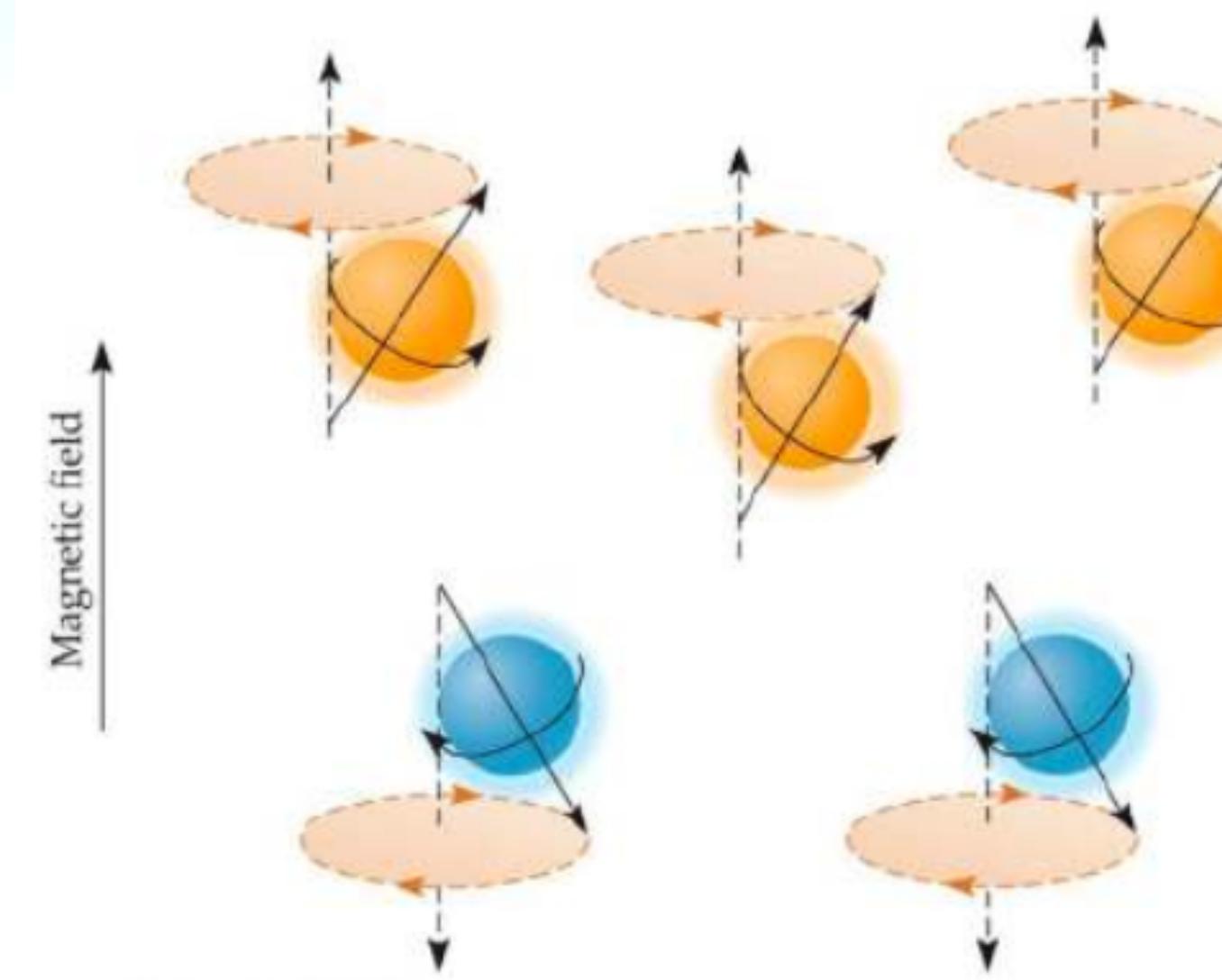
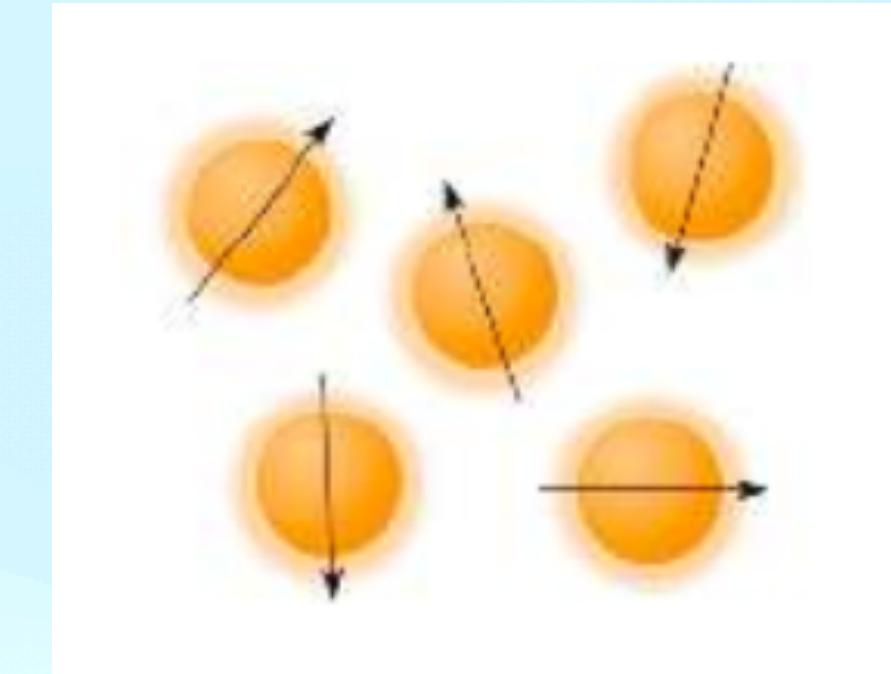
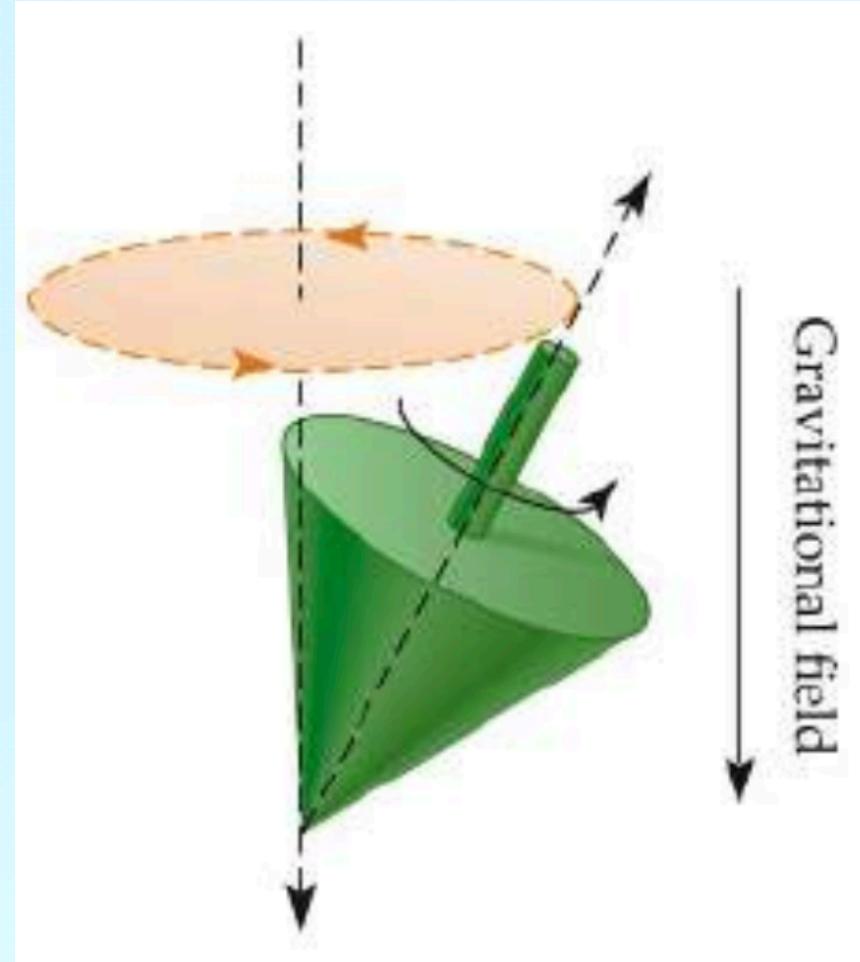
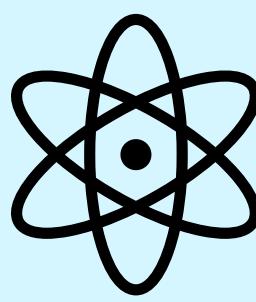
Physikalische Grundlagen



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Technische Aspekte von fMRT-Geräten

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- mind. 10.000 Mal stärker ist als das magnetische Feld der Erde



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- basiert auf der Verwendung von starken Magnetfeldern und Radiowellen



Technische Aspekte von fMRT-Geräten



- mind. 10.000 Mal stärker ist als das magnetische Feld der Erde
- basiert auf der Verwendung von starken Magnetfeldern und Radiowellen
- nicht invasiv und verursachen keine ionisierende Strahlung

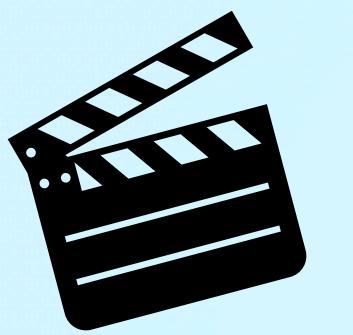


Datenanalyse

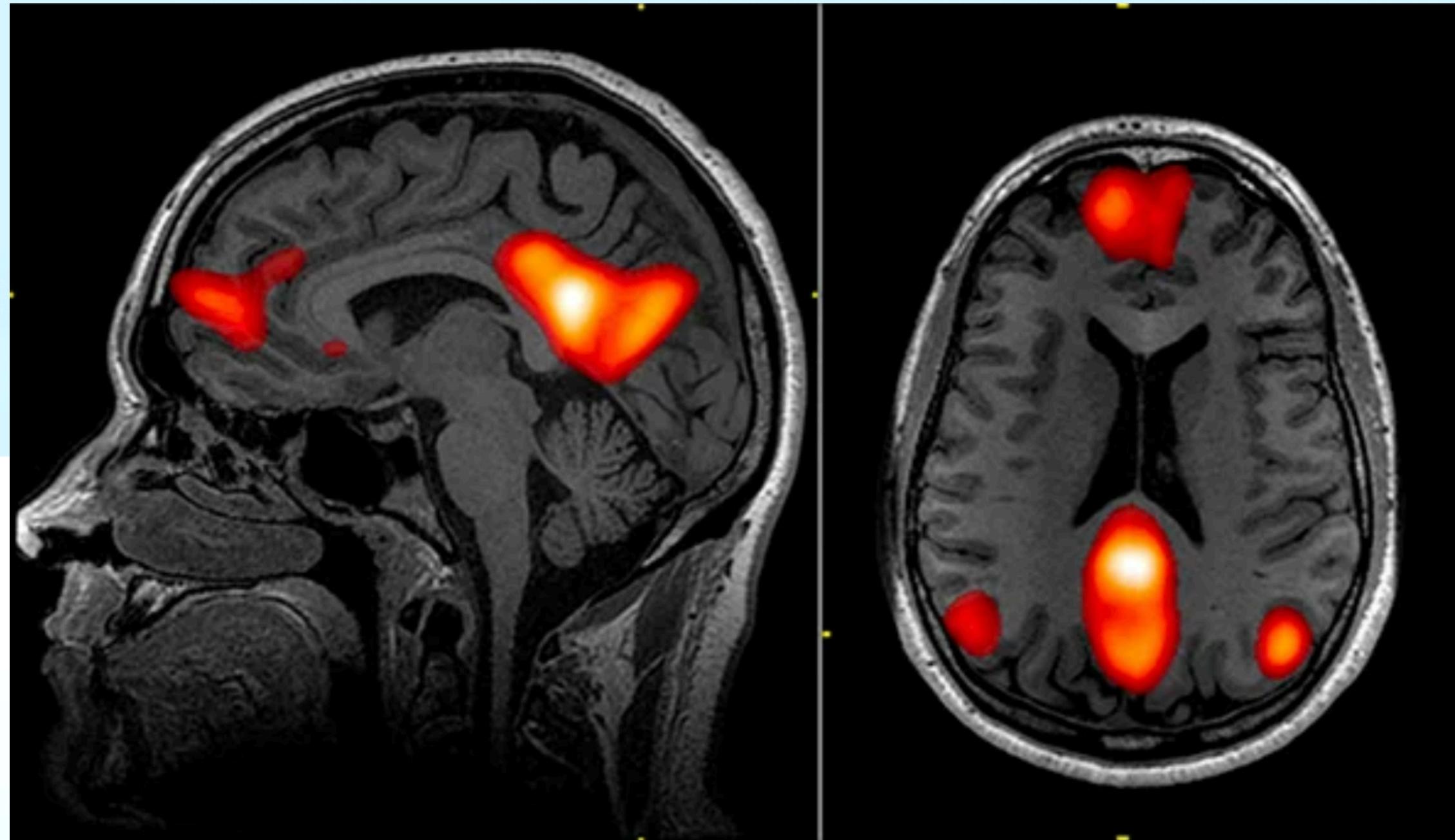


bei fMRI

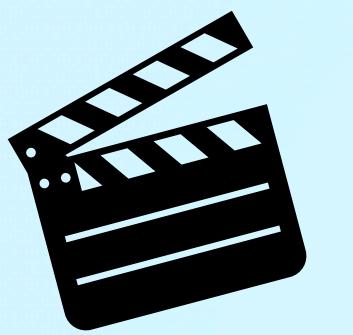
Datenanalyse



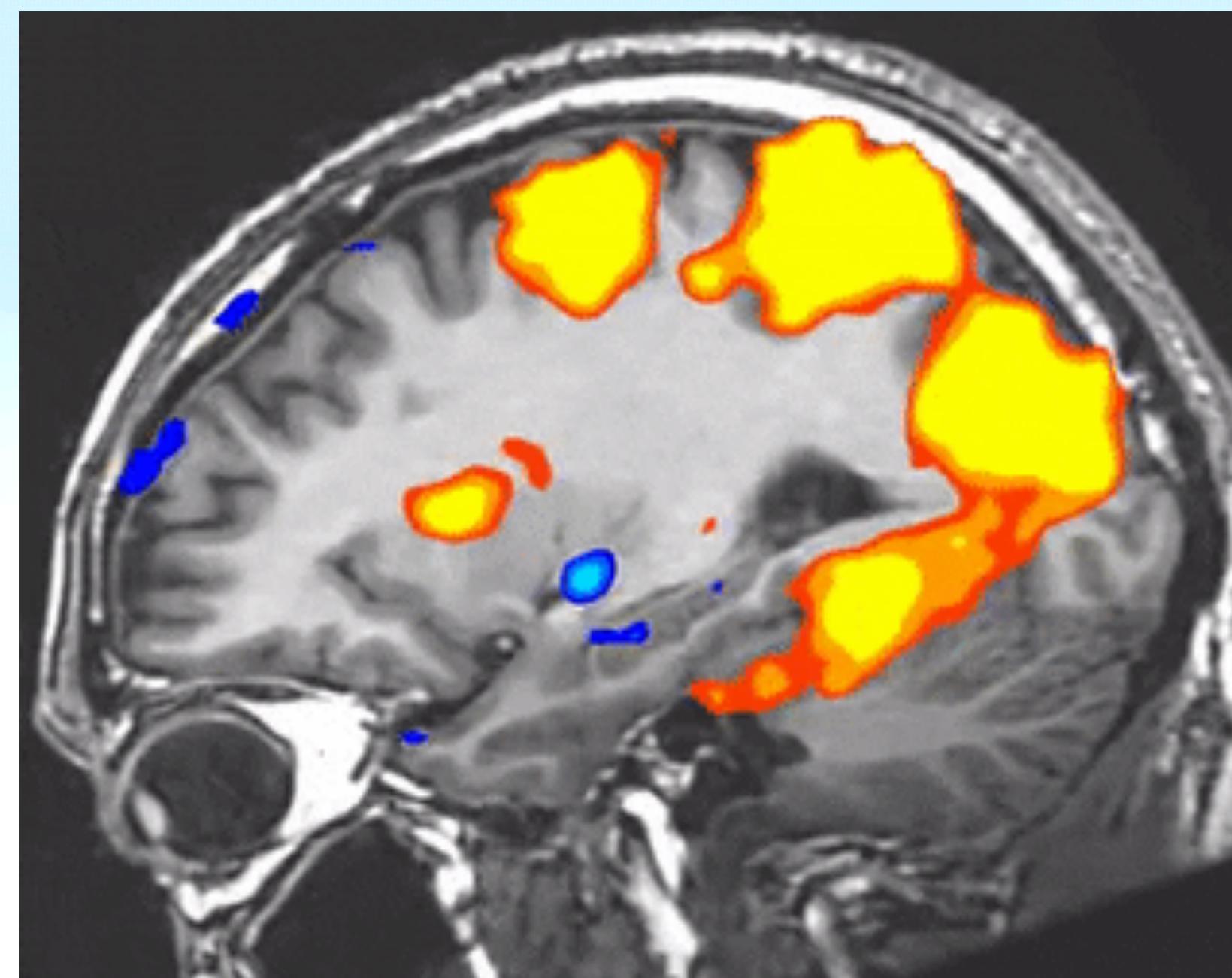
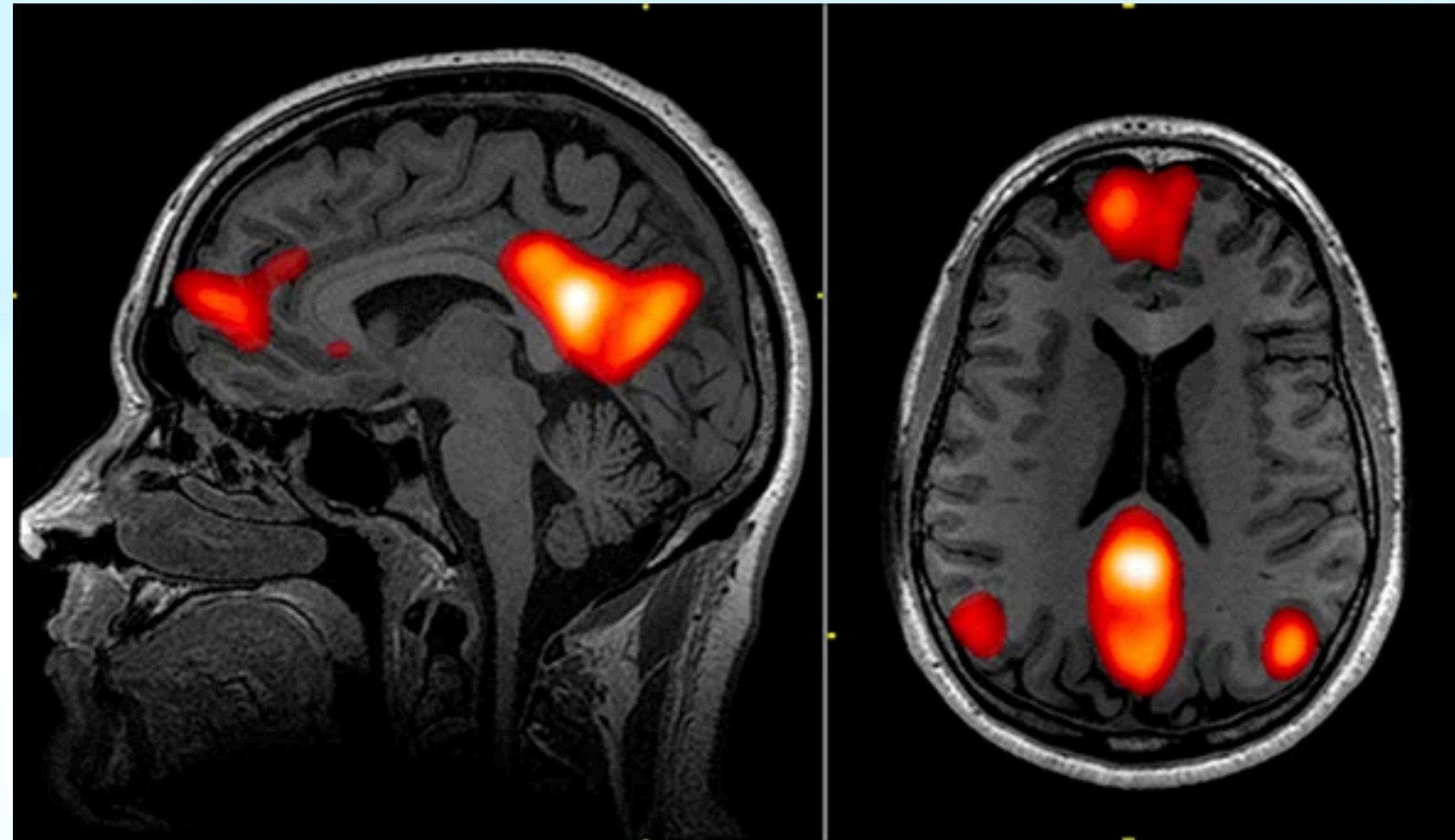
bei fMRI



Datenanalyse

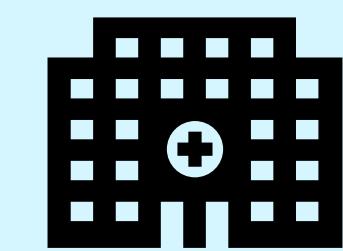


bei fMRI



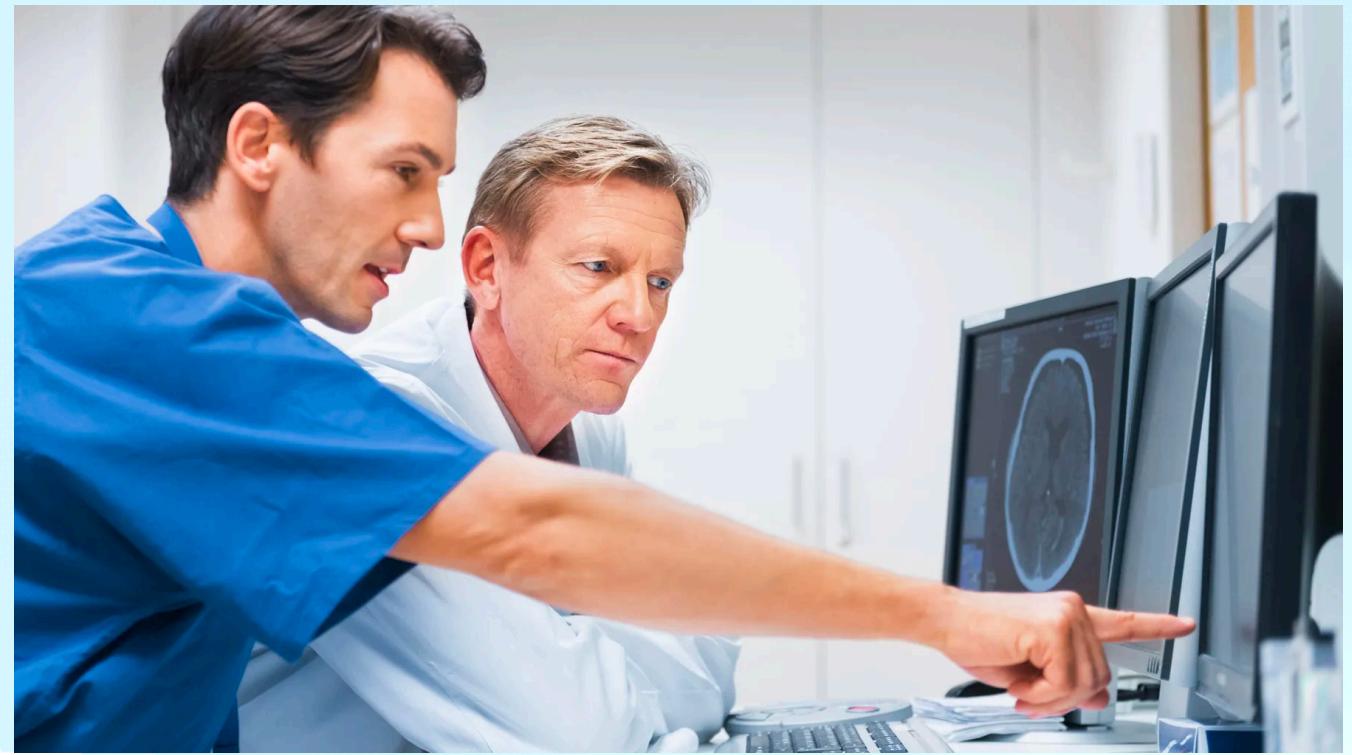
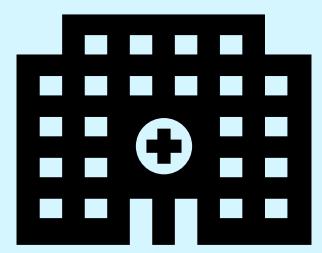
Anwendungsgebiete

Neuro-Onkologie und Radiotherapie



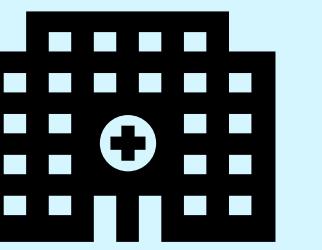
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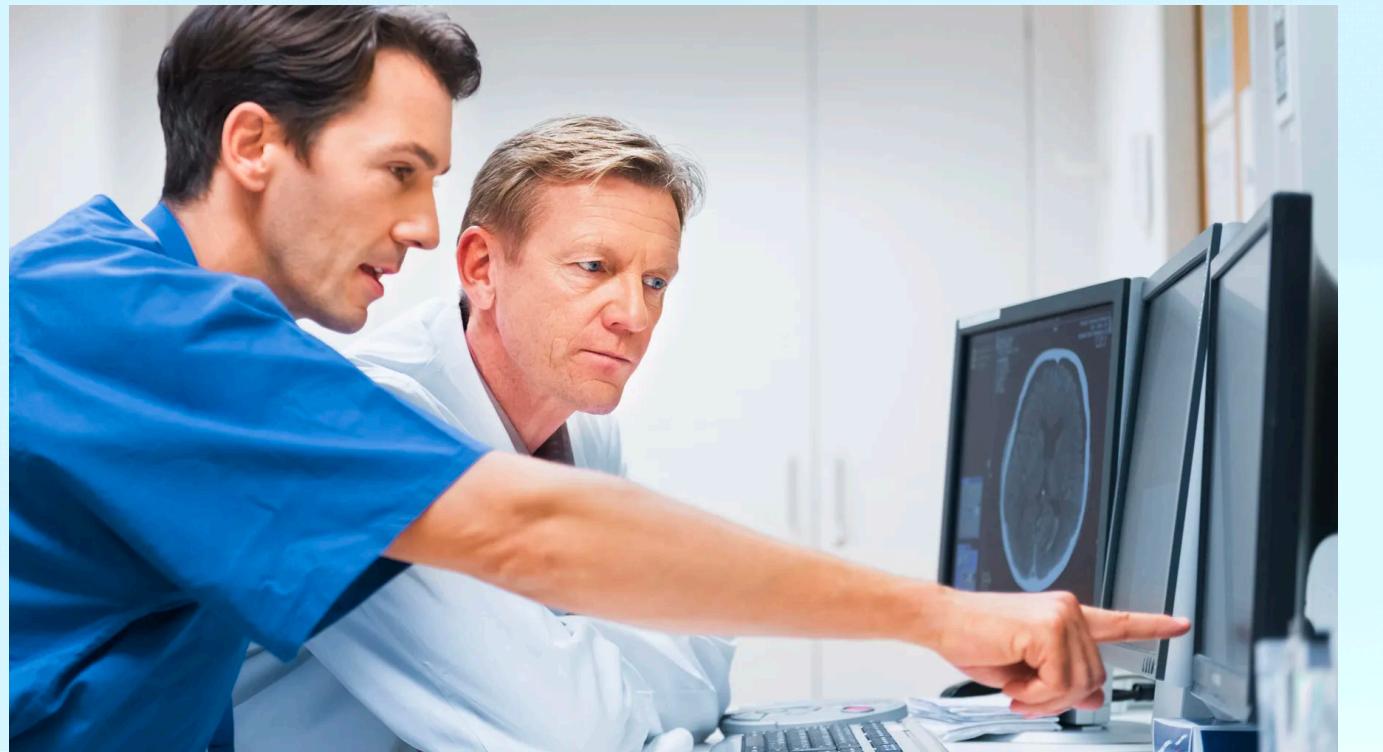
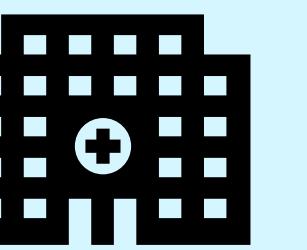
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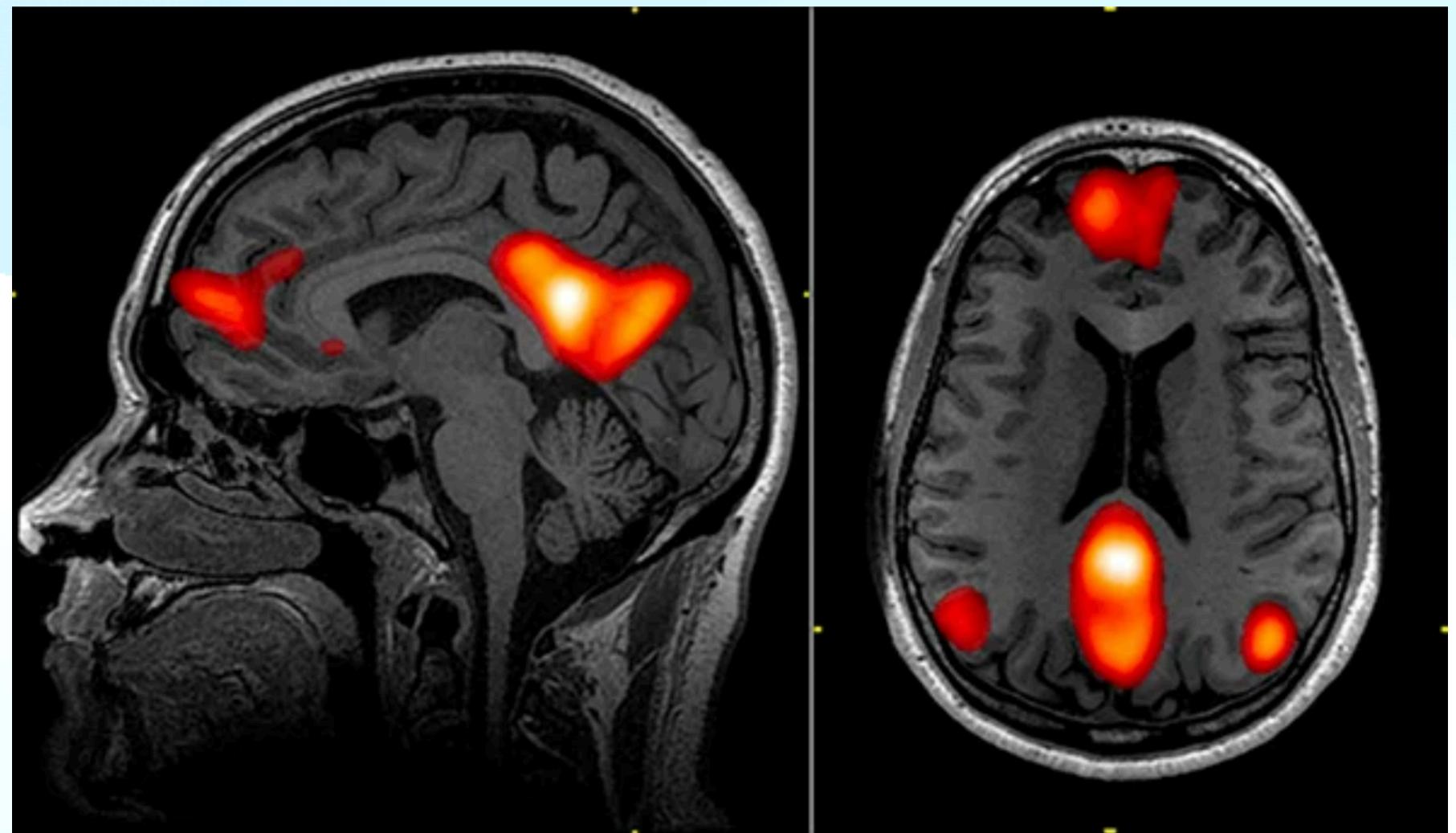
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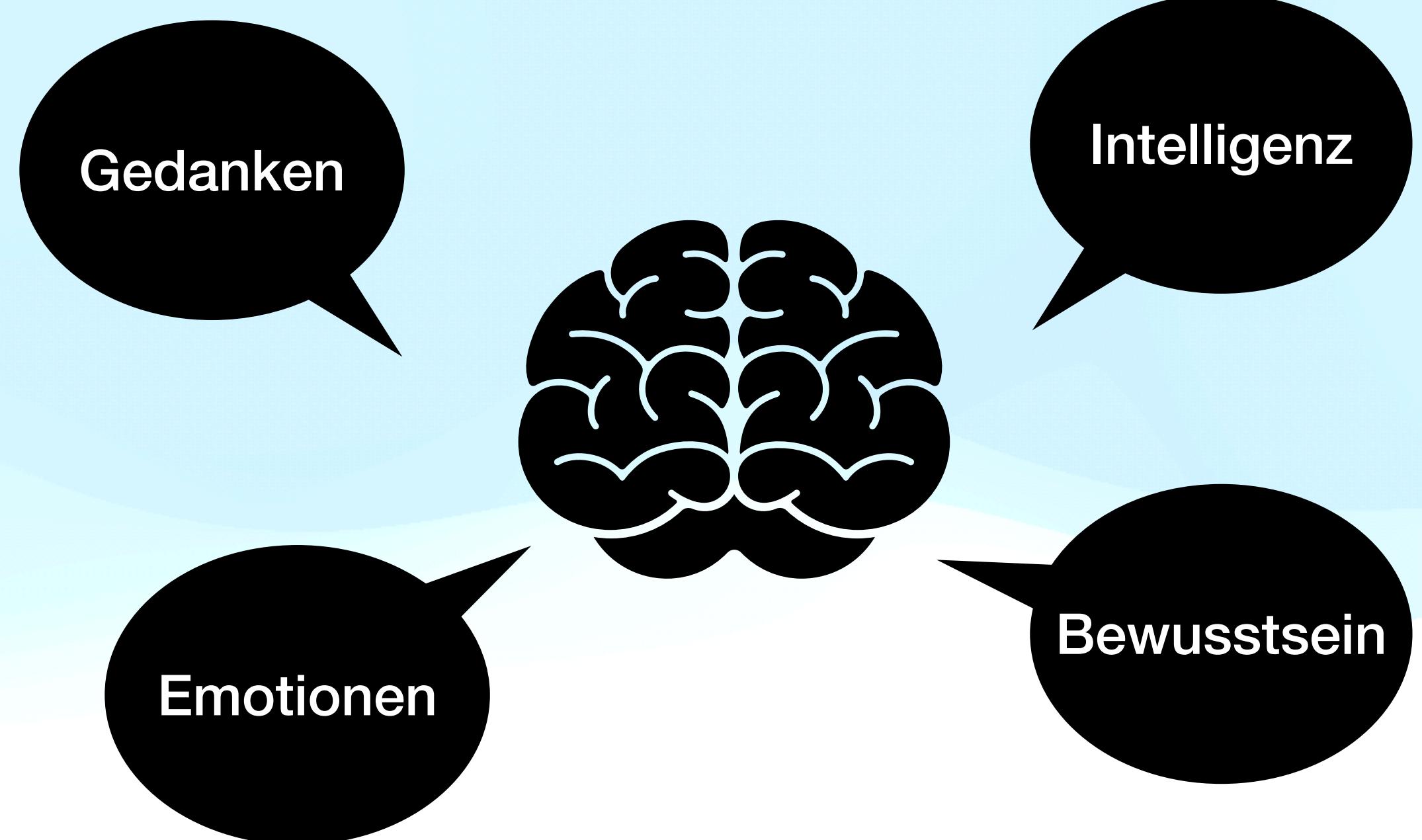
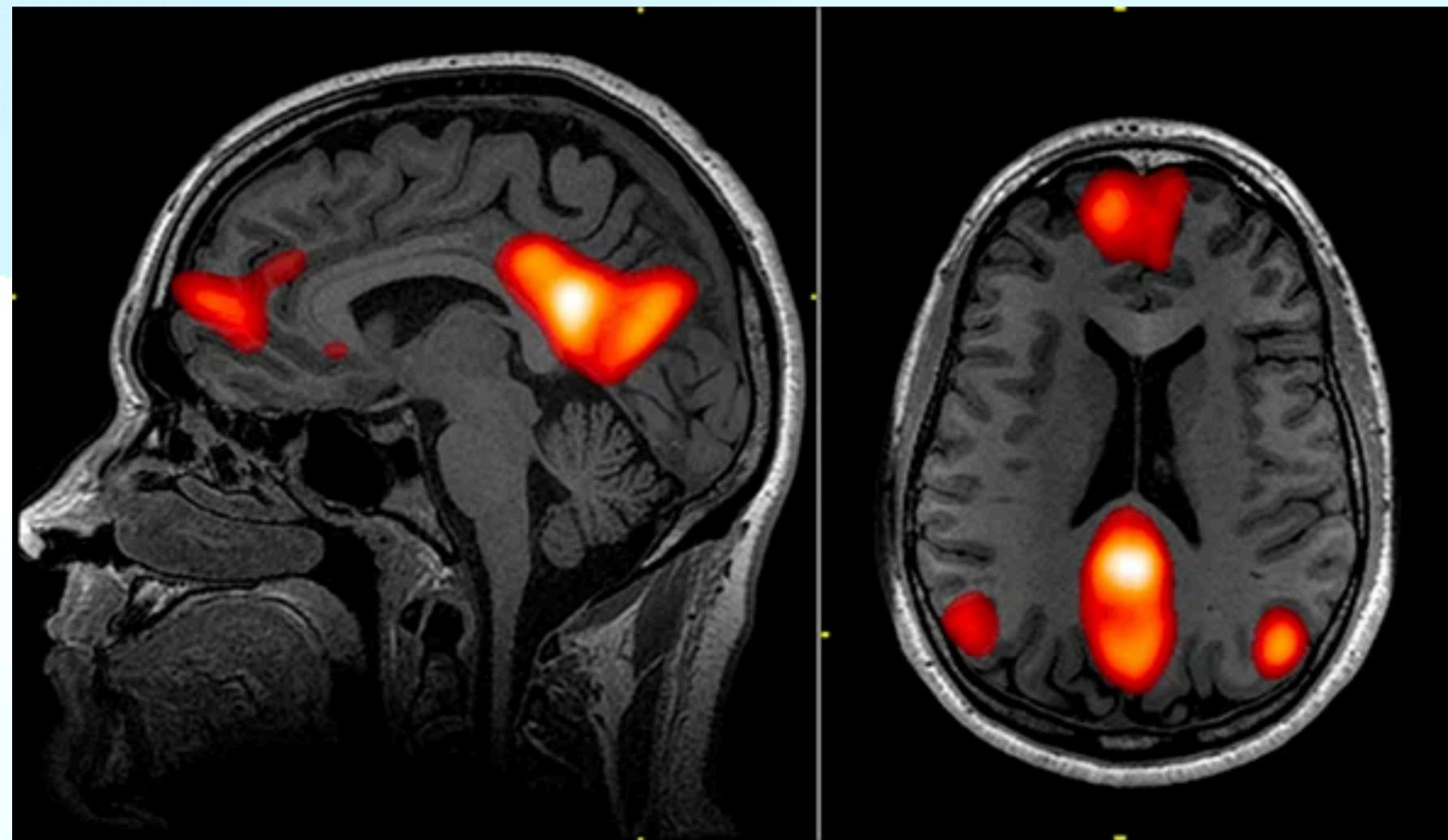


Zusammenfassung & Ausblick

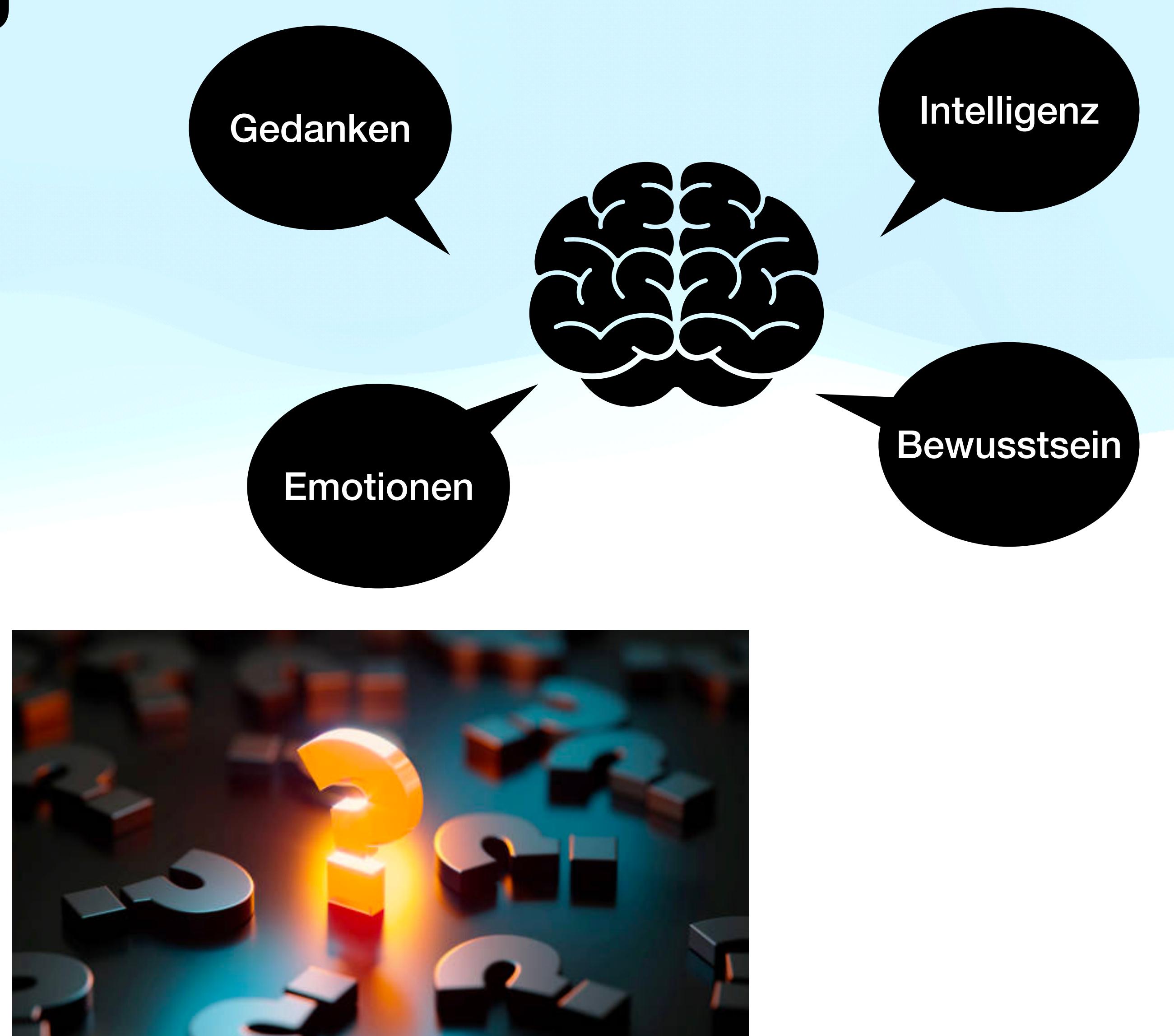
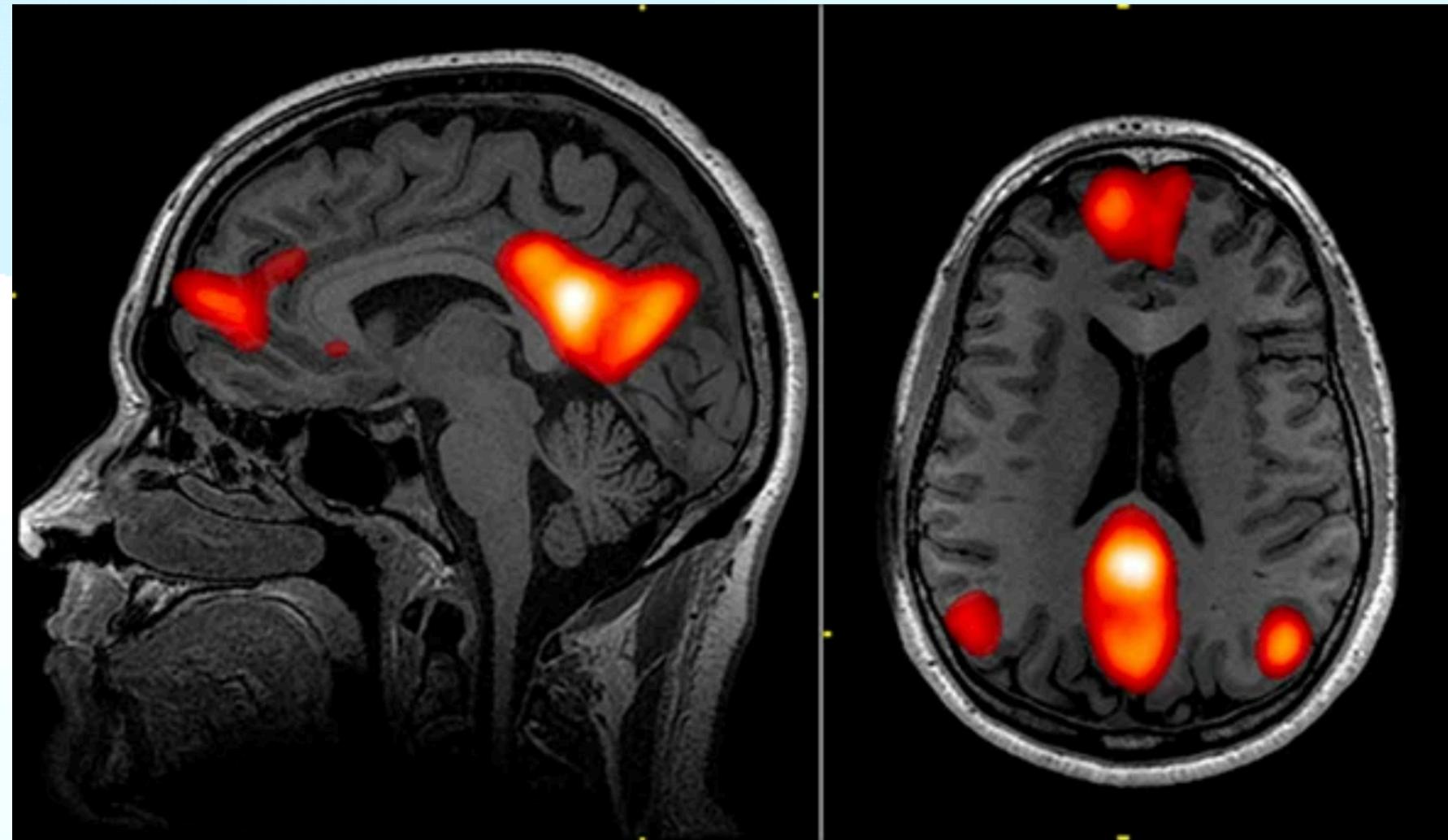
Zusammenfassung & Ausblick



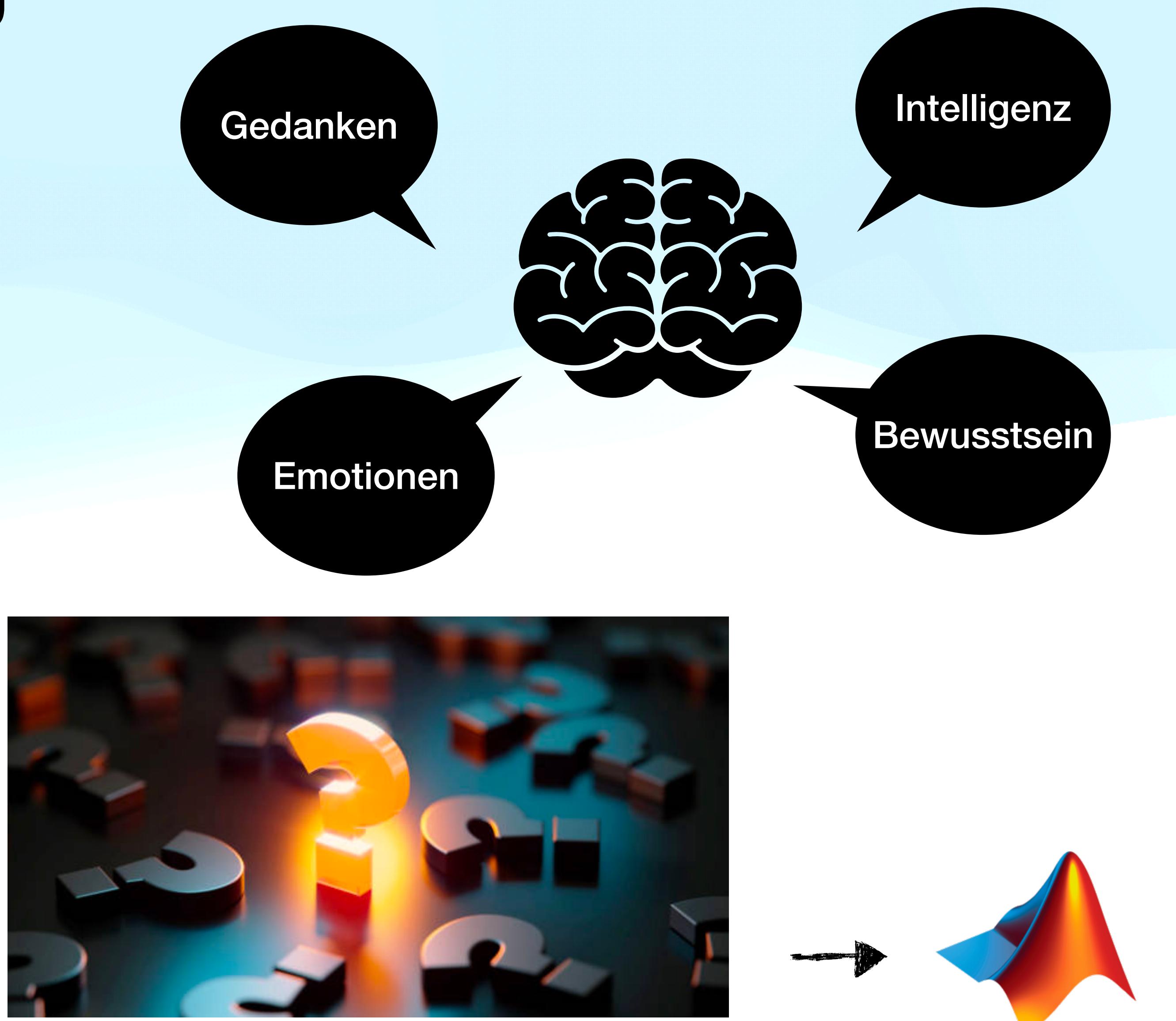
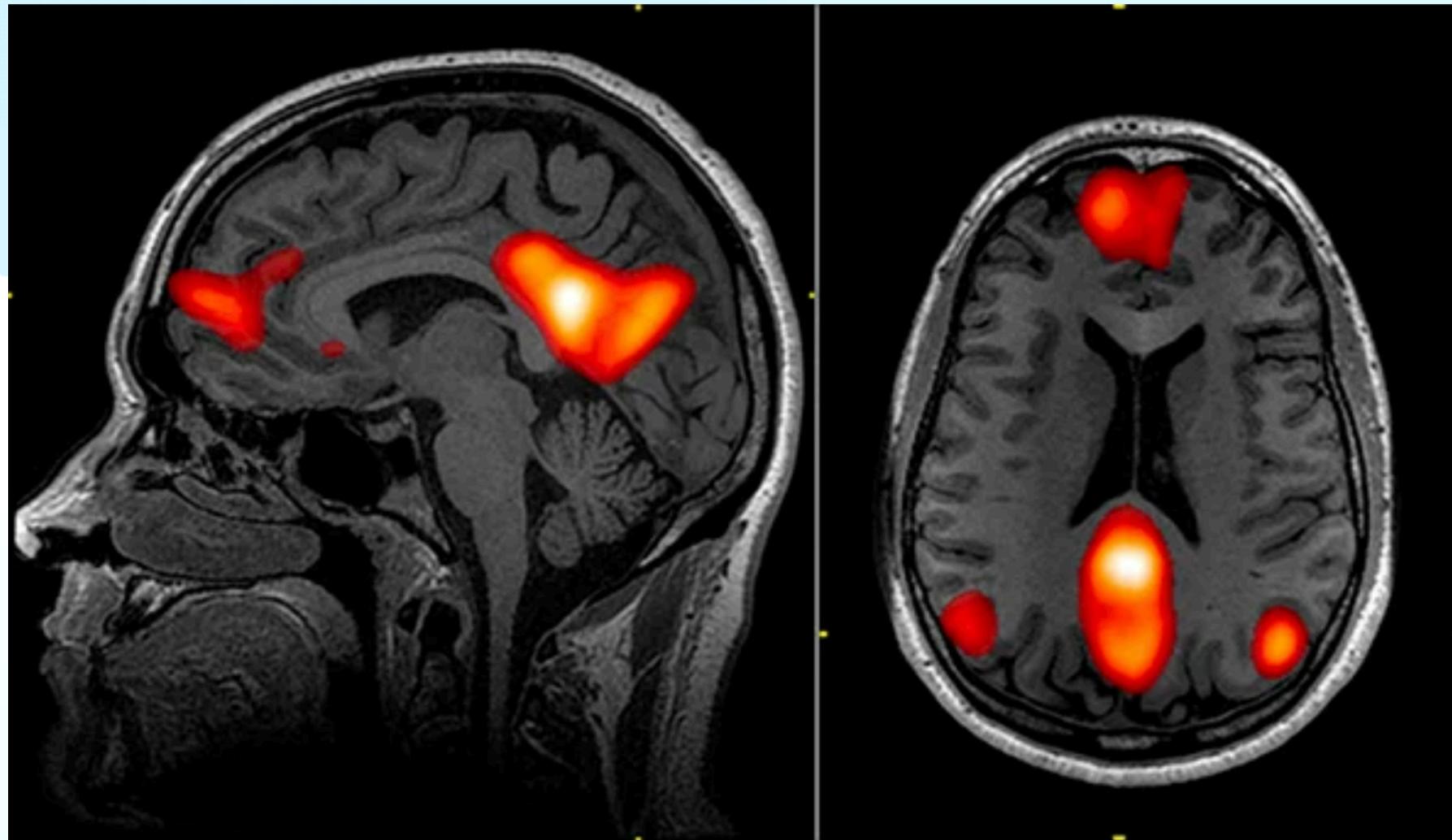
Zusammenfassung & Ausblick



Zusammenfassung & Ausblick



Zusammenfassung & Ausblick



Quellen

Abbildungen:

- https://mediapool.hm.edu/media/dachmarke/dm_lokal/forschung_mediapool/fo_medien/Fo_MeetUp_Banner_Gender_Innovations_portrait_m.png
- <https://www.google.com/url?sa=i&url=https://braintest.sommer-sommer.com/de/&psig=AOvVaw0X4-Bjp9OI1NyjxTO3LM6Y&ust=1687380535871000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCNDMtOjd0v8CFQAAAAAdAAAAABA0>
- https://www.google.com/imgres?imgurl=https://i.imgur.com/tu7vvbJ.png&tbnid=3IkVA6oo9MOusM&vet=10CAQQxiAoA2oXChMI0My06N3S_wIVAAAAAB0AAAAAEEM..i&imgrefurl=https://gopalpurcollege.ac.in/schuh-rosa-oder-grau-gehirnh%C3%A4lfte-k.html&docid=y3wyswF_VYesNM&w=962&h=1203&itg=1&q=welche gehirnh%C3%A4lfte ist starker test bild&ved=0CAQQxiAoA2oXChMI0My06N3S_wIVAAAAAB0AAAAAEEM
- <https://www.google.com/url?sa=i&url=https://www.antenne.at/darueber-streitet-das-netz&psig=AOvVaw0X4-Bjp9OI1NyjxTO3LM6Y&ust=1687380535871000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCNDMtOjd0v8CFQAAAAAdAAAAABAn>
- <https://www.google.com/url?sa=i&url=https://www.swr.de/wissen/1000-antworten/wie-viele-gigabyte-hat-unser-gehirn-100.html&psig=AOvVaw1QJi1C1TD9tEfh5FW3pxZE&ust=1687386336354000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCMjD2pny0v8CFQAAAAAdAAAAABAD>
- https://www.google.com/url?sa=i&url=https://it.sainte-anastasie.org/articles/neurociencias/lbulo-parietal-funciones-anatomia-y-curiosidades.html&psig=AOvVaw3tj8Kf-G24g8nZV5LyBvcW&ust=1687386581912000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCMiLi_zz0v8CFQAAAAAdAAAAABAQ
- <https://www.studocu.com/de/document/georg-august-universitat-gottingen/behaviorale-neurowissenschaften/vorlesung-31-physikalische-grundlagen-der-mr-bildgebung-teil-1/35525085>
Vorlesung 3: Grundlagen der MR-Bildgebung (Teil 1) Seite 14,15.
- https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.istockphoto.com%2Fde%2Ffotos%2Ffragen&psig=AOvVaw17eav_3OyrRjFVMQ4_0J7e&ust=1687393862944000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCPidpJGO0_8CFQAAAAAdAAAABAE
- <https://gfycat.com/sourcreamyfantail>
- https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.t-online.de%2Fgesundheit%2Fkrankheiten-symptome%2Fid_91807190%2Ftiefe-hirnstimulation-wie-ein-hirnschrittmacher-hilft.html&psig=AOvVaw1bGTT4nBa9mrUmvGYARwpc&ust=1687390807680000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCNi3hOOC0_8CFQAAAAAdAAAAABAo
- https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.west-gmbh.de%2Fblog%2Fmachine-learning-fertigung-anwendungsbeispiele&psig=AOvVaw2wfRy_KNIuIMdm9DHGsLzT&ust=1687391033783000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCKDzxc-D0_8CFQAAAAAdAAAAABAD

Quellen

Web:

- Inside Hochdorf. (2018). Retrieved from <https://inside.hochdorf.com/de/fakten-ueber-unser.gehirn#:~:text=Das%20Gehirn%20eines%20Erwachsenen%20macht,DHA%20aus%2C%2015%25%20AA>
- PubMed. (2016). Retrieved from <https://pubmed.ncbi.nlm.nih.gov/27432660/#:~:text=Abstract,basic and applied neuroscience research>
- University of Edinburgh - Structural MR. (2021). Retrieved from <https://www.ed.ac.uk/clinical-sciences/edinburgh-imaging/research/themes-and-topics/medical-physics/imaging-techniques/structural-mr>
- Psych Central - What is Functional Magnetic Resonance Imaging (fMRI)? (n.d.). Retrieved from <https://psychcentral.com/lib/what-is-functional-magnetic-resonance-imaging-fmri?c=1188759824#definition>
- FMRI-Easy - Physik. (n.d.). Retrieved from <http://www.fmri-easy.de/physik.htm>
- Basicscs of fMRI. (2020). Retrieved from <https://www.youtube.com/watch?v=-C84RFgyzUE>
- Systems Neuroscience Using fMRI: Studying the Brain to Understand the Mind. (2018). Retrieved from https://www.youtube.com/watch?v=eN-zCol_Ejc&t=34s from 17min
- fMRI - How it Works and What it's Good For. (2015). Retrieved from https://www.youtube.com/watch?v=Rb_mdzgw-Jc
- Lecture Notes. (2021). Retrieved from <https://www.studocu.com/de/document/georg-august-universitat-gottingen/behaviorale-neurowissenschaften/vorlesung-31-physikalische-grundlagen-der-mrbildgebung-teil-1/35525085>
- How FMRI works (2022) <https://www.open.edu/openlearn/body-mind/health/health-sciences/how-fmri-works>
- MRT Datenanalyse. Max-Planck-Institut.(n.d.). <https://www.cbs.mpg.de/ehemalige-abteilungen/neurophysik/mrt-datenanalyse#:~:text=Analysis and interpretation of functional MRI-Data&text=In a typical fMRI experiment,images taken from the MRI-Scanner>
- Hirnscans lassen sich unterschiedlich lesen. Das Problem gehen Forscher jetzt proaktiv an. Lena Stallmach. (2020). <https://www.nzz.ch/wissenschaft/hirnscans-lassen-sich-unterschiedlich-auswerten-das-beeinflusst-auch-das-ergebnis-ld.1558507>
- Ein anderer Blickwinkel ins Gehirn. Werner-Reichardt-Centrum für Integrative Neurowissenschaften (CIN) (2015) <https://healthcare-in-europe.com/de/news/ein-anderer-blickwinkel-ins-gehirn.html>
- Datenanalyse: Vorverarbeitung, Statistik und Auswertung (n.d.) https://link.springer.com/chapter/10.1007/978-3-540-68558-6_8
- Was ist dran am Mythos um die linke und rechte Gehirnhälfte? <https://www.ime-seminare.de/blog/was-ist-dran-am-mythos-um-die-linke-und-rechte-gehirnhälfte/>