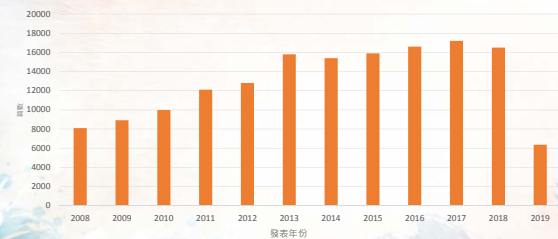


窺探孩子的大腦奧秘： fMRI應用於兒童研究

身體、心靈與文化整合影像研究中心
翁巧涵

Keywords: children, fMRI



Why choose MRI?

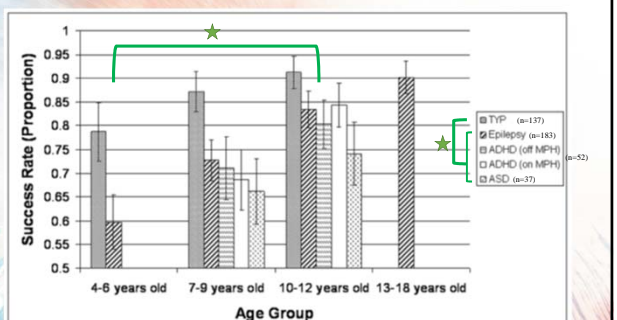
- MRI is the most promising and broadly used imaging technology.
- MRI is safe for use in pediatric populations.
- MRI is noninvasive and harmless tools.
- There is no radioactivity present at any time.

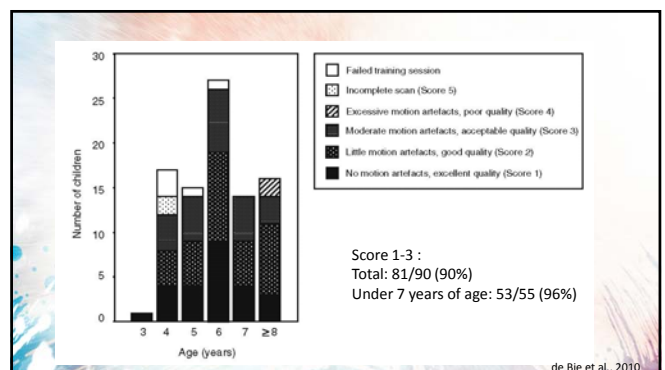
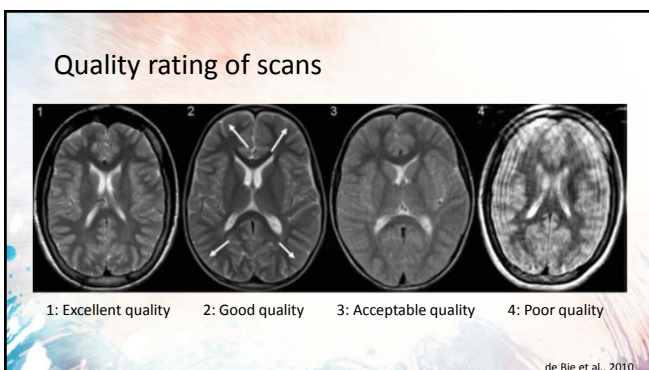
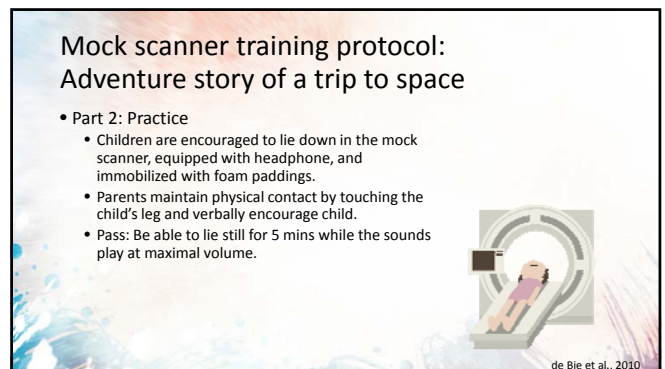
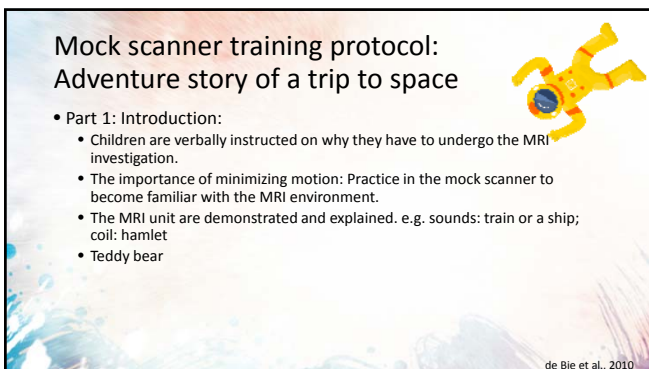
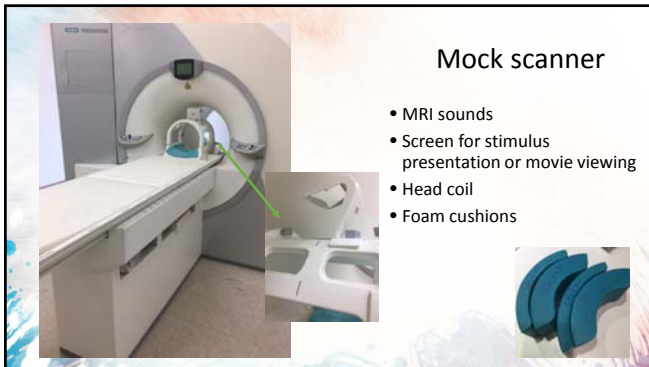
Studying brain development

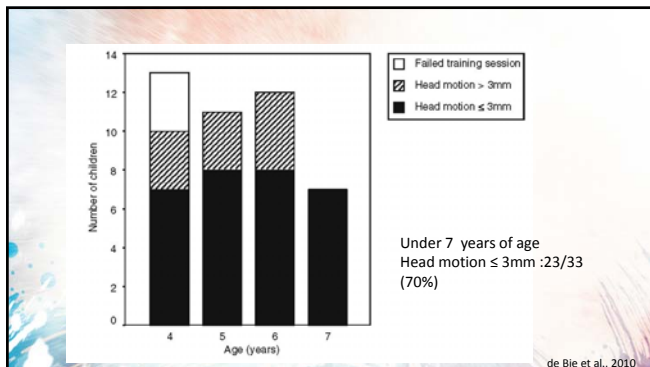
- How the brain develops in typically developing children and what is different in the brains of children with various neurodevelopmental disorders?
- Understanding **developmental trajectories** is a primary aim of developmental neuroscience.
- Developmental neuroimaging studies aim to characterize the **neural basis of age-related changes in behavior**.
 - Structural
 - Functional

Studying brain development

- Participants:
 - Typically developmental children
 - Clinical populations: Attention Deficit/Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), Epilepsy, Dyslexia, developmental coordination disorder, etc.
- Age:
 - Reliably be scanned usually above 7 or 8 years old (Luna et al., 2010).







Mock scanner training protocol: Adventure story of a trip to space

- Training protocol with a mock MRI scanner can be applied in 4 to 7 year old children.
- Qualified and motivated personnel and good coaching during the training session and MRI investigation are indispensable for a good outcome.
- Maintaining the same staff across setting may reduce parent and child anxiety.

de Bie et al., 2010

Other training protocol

- Watch video or pictures: (Prepare the child in his or her home)
- <http://cibr.stanford.edu/GettingReady/HomePreparation.html>
- <https://youtu.be/LaAjrPbahBA>

Other training protocol

- Tunnel tents:
 - a toy tunnel
 - a hat box and foam padding (head-coil)
 - a vibrating massage mat (scanner movement)
 - A video player (sounds)
- The success rates for using a mock scanner and a cheap play tunnel were not significantly different.



(Barnea-Goraly et al., 2014)

Other training protocol

- Play therapy and a miniature scanner models



(Wille et al., 2015)

Following the training

- A brief summary of the study.
- Any questions? Give children an opportunity to ask questions. (familiar words or metaphors)
- Discuss what was learned?
 - No mental
 - Movement: blurry photographs, "playing the statue game"
- Be alert with regard to signs of anxiety.

Actual scanning

- Make sure the child actually understand the instructions: Practicing the task outside and inside the scanner
 - Repeat the instructions directly before the task
- Children enter the scanner with at least one of their parents.
- Distraction devices: Showing videos during scans can significantly reduce motion.



Send the child to the restroom before the beginning of the scanning session!



Something you should know

- A child-friendly environment: a calm atmosphere



Yale New Haven Children's Hospital



Florida Hospital

Something you should know

- A child-friendly environment: a calm atmosphere



Barcelona Hospital



University of Pittsburgh Hospital

- A child-friendly environment: Scanning room was decorated with a variety of colorful posters, curtains, and soft toys.



Something you should know

- Before the scan
 - A child-friendly environment: a calm atmosphere
 - Child-friendly language: "large camera", "mirror holder", "helmet".
 - Make sure the child is lying comfortably.
- During the scan
 - Online evaluation of head motion and scan quality: Scanning console
 - Encourage often: Provide positive feedback during the scan.
- After the scan
 - Show pictures of brain scans
 - Tangible and positive reinforcers: stickers, pencils, model cars, etc.



Something you should know

- Task:
 - Not too long: In the range of about 5-6 min.
 - Not too hard(or too easy): Task demands should be age-appropriate, and neither too hard nor too boring.
 - Monitor engagement: Following the pattern of responses, postscan questions.

Ethics issues

- Maximizing benefits and minimizing risks, obtaining informed consent, fair selection of participants, doing no harm.
- A matter of treatment or enhancement.
- Incidental findings:

"Incidental Findings: The investigators for this project are not trained to perform radiological diagnosis, and the scans performed in this study are not optimized to find abnormalities. The investigators and Stanford are not responsible for failure to find existing abnormalities in your MRI scans. However, on occasion the investigator may notice a finding on a MRI scan that seems abnormal. When this occurs, a neuroradiologist will be consulted as to whether the finding merits further investigation, in which case the investigator will contact you and your primary care physician and inform you of the finding. The decision as to whether to proceed with further examination or treatment lies solely with you and your physician. The investigators, the consulting neuroradiologist, and Stanford are not responsible for any examination or treatment that you undertake based upon these findings. Because the images collected in this study do not comprise a proper clinical MRI series, these images will not be made available for diagnostic purposes."

(Illes et al., 2002)

Thank you!



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