

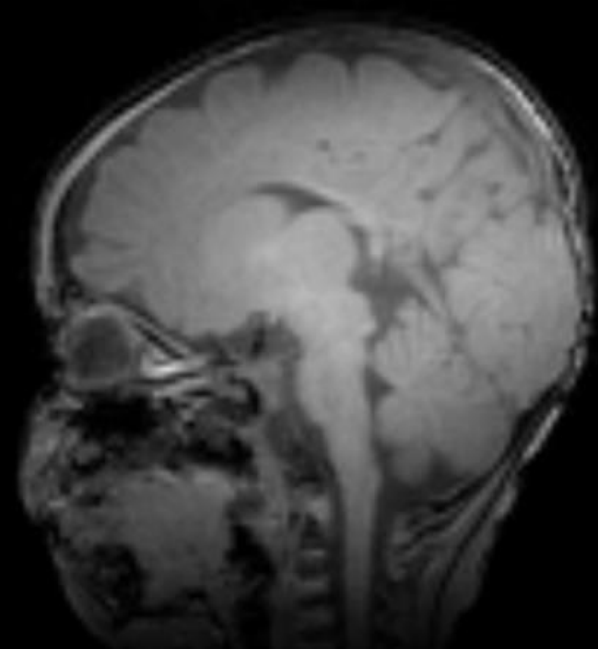


“If we want to assess brain health, we need to measure the brain”



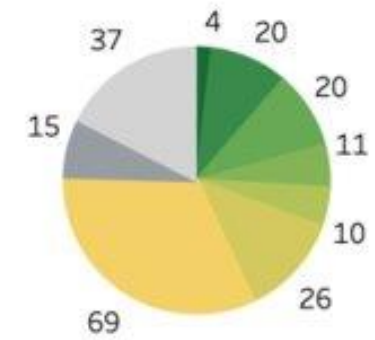
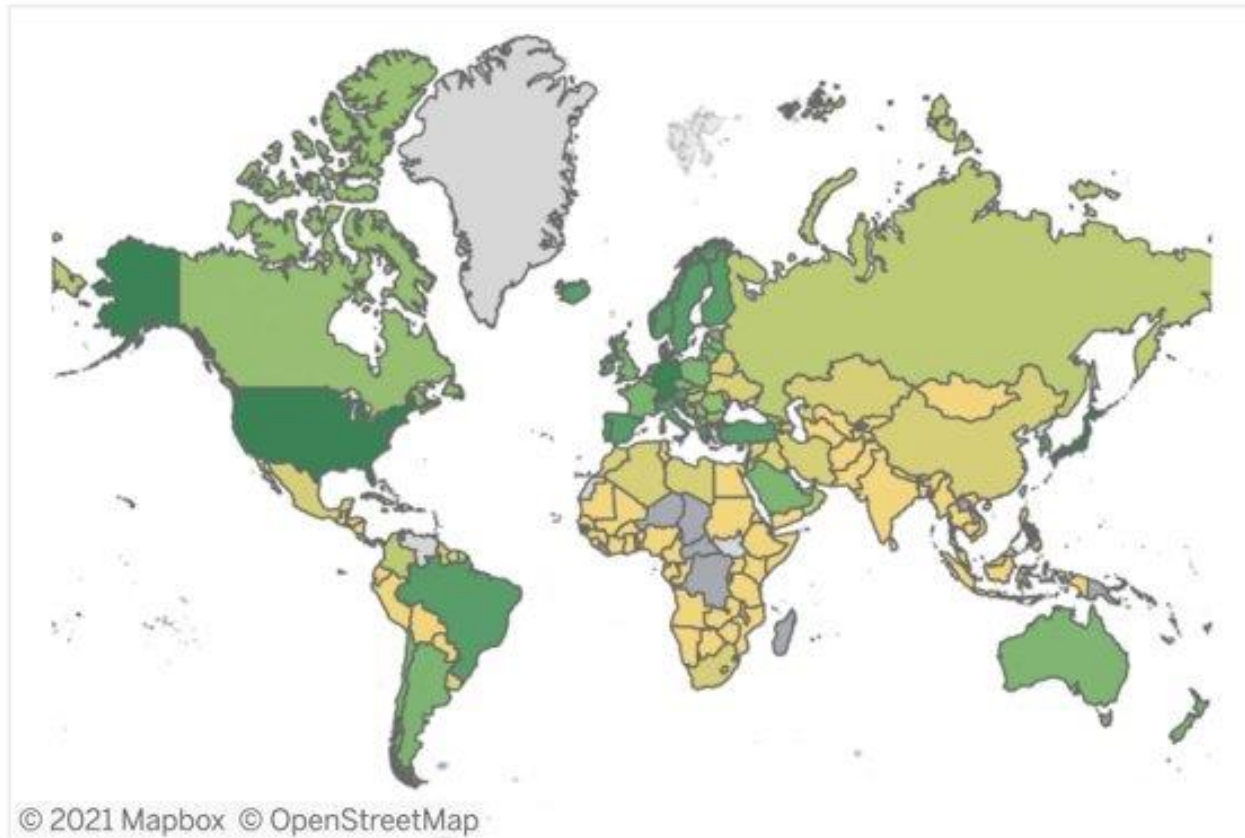
**Laurel
Gabard-Durnam**





MRI units (per 1 mil)

Countries	Countries with MRI units	Regions	Population (mil)	Number of MRI units	MRI units (per 1 mil)
212	160	6	7,674M	51,498	6.711



MRI units ranges

- More than 30
- Between 15 and 30 (inc)
- Between 10 and 15 (inc)
- Between 7.5 and 10 (inc)
- Between 5 and 7.5 (inc)
- Between 2.5 and 5 (inc)
- Between 0 and 2.5 (inc)
- No MRI units
- Data not available

Country



Mobile
MRI
Scanner
Unit

www.alliancemedical.co.uk

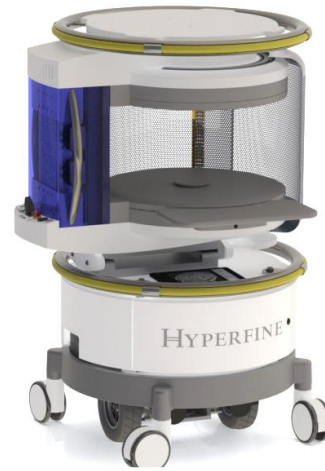
BE CAREFUL

Watch
your step.

MAIN
ENTRANCE

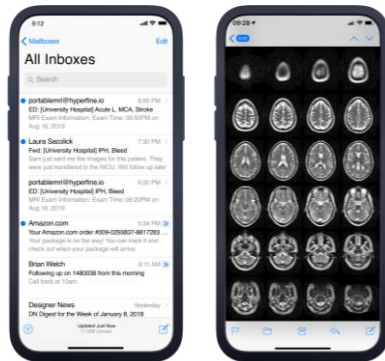
AV8

Portable MRI at Point of Care

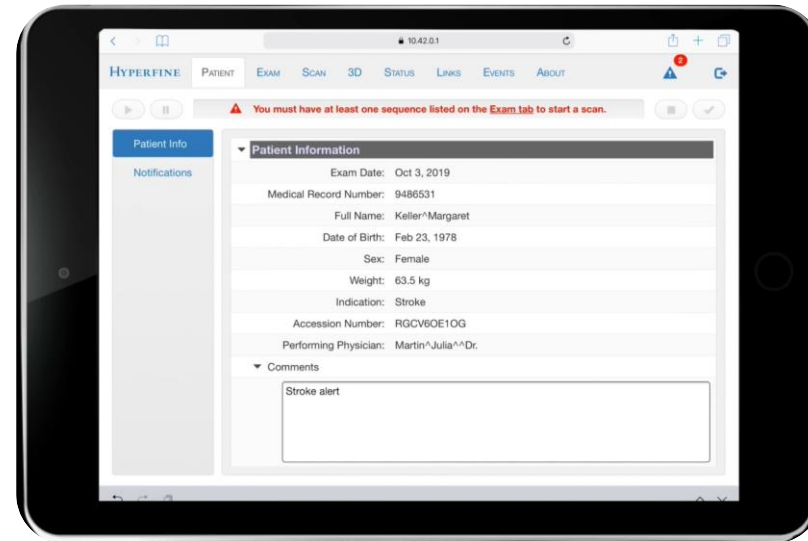


BILL & MELINDA
GATES *foundation*

HYPERFINE



From MRI to phone



MRI anyone can use



From MRI to cloud

GLOBAL ACCESS & HARMONISATION (for BRAIN examinations across the lifespan)

MRI for point-of-care.

\$1,100,000 + \$150,000

Fixed

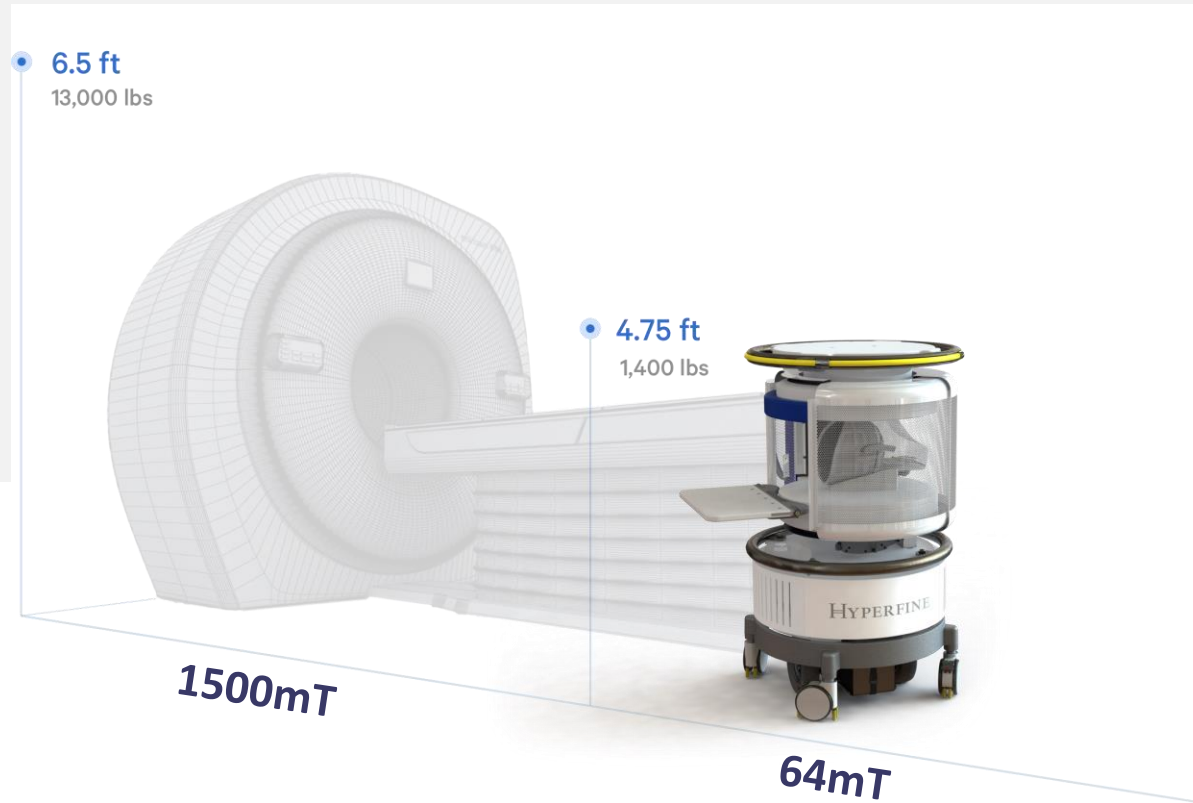
8,500 lbs

Coils & Electronics separate

Software purchases separate

Cryogen Infrastructure

RF shielded room



~10% of the cost

Portable

1,200 lbs

Coils & Electronics included

Software included

No Cryogen

No shielded room

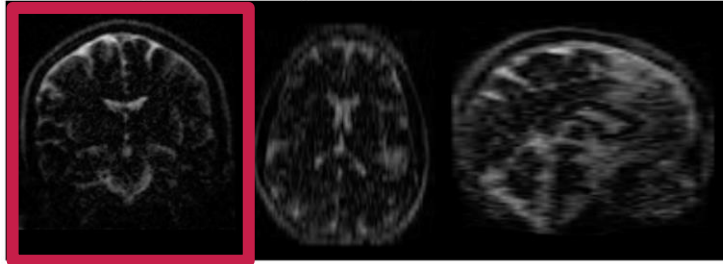
Power



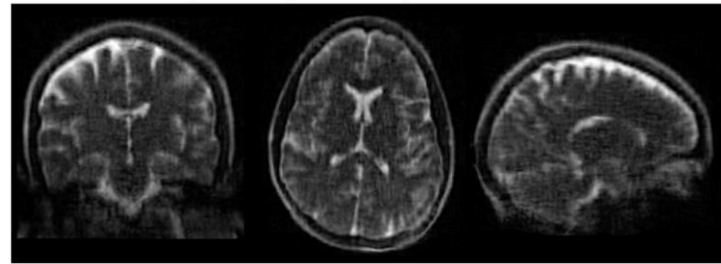
(900W maximum power)

Ultralow Field MRI – Towards Optimised Structural MRI

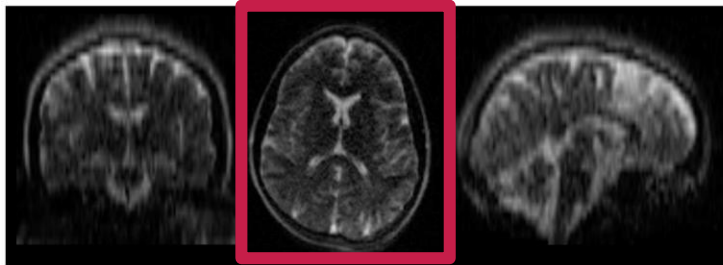
Coronal T₂-Weighted: TE = 242ms, (1.5 x 5 x 1.5)mm³



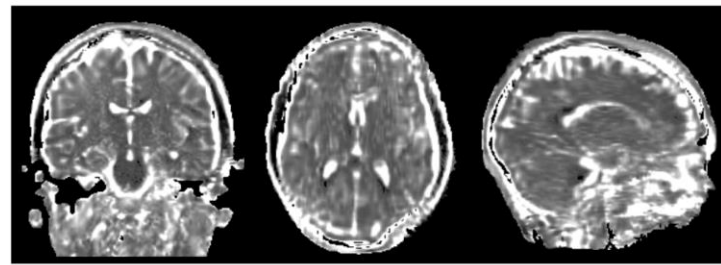
Reconstructed Isotropic Volume (1.5 x 1.5 x 1.5)mm³



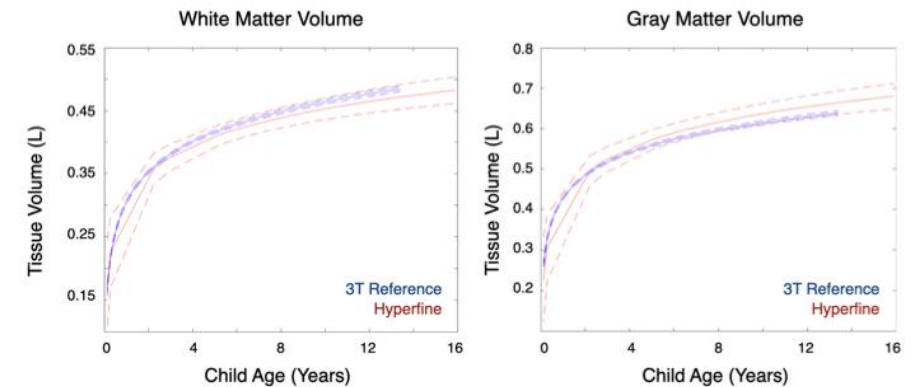
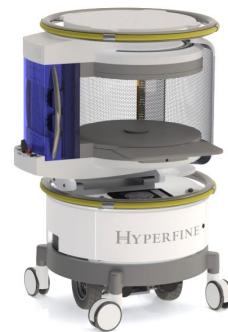
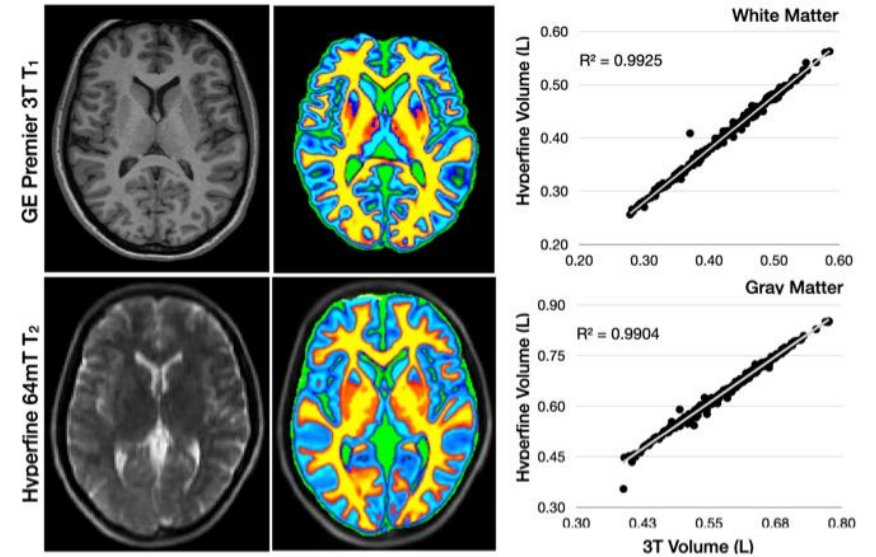
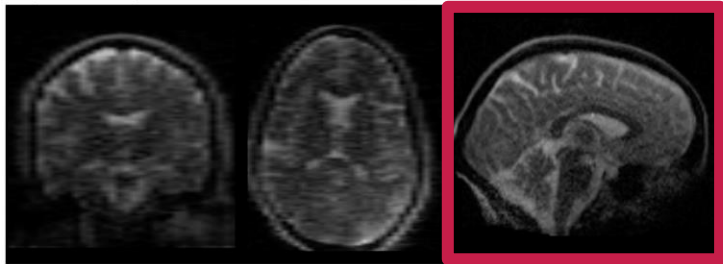
Axial T₂-Weighted: TE = 182ms, (1.5 x 1.5 x 5)mm³

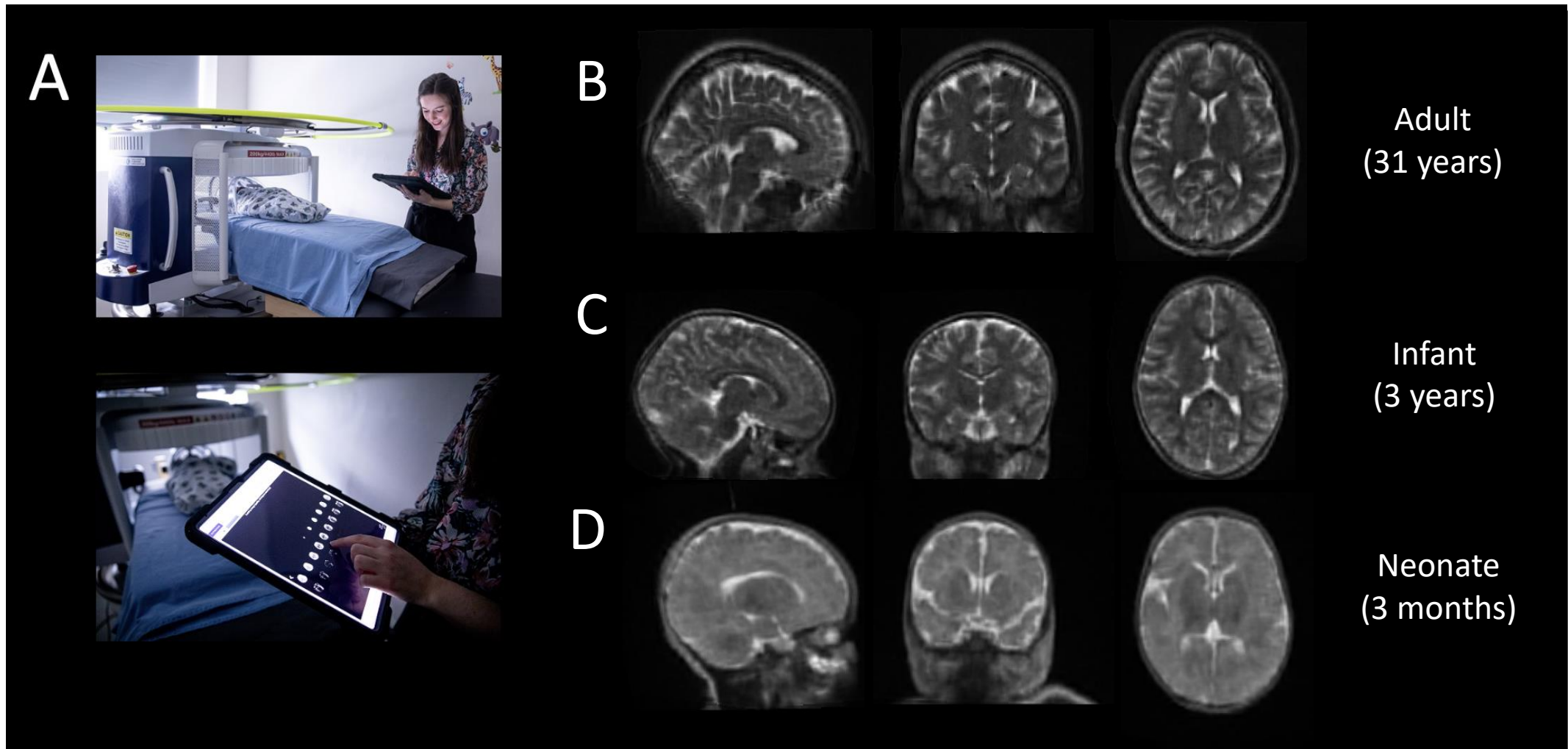


Multi-Echo Time, Multi-Orientation qT₂ Map with Noise Filtering

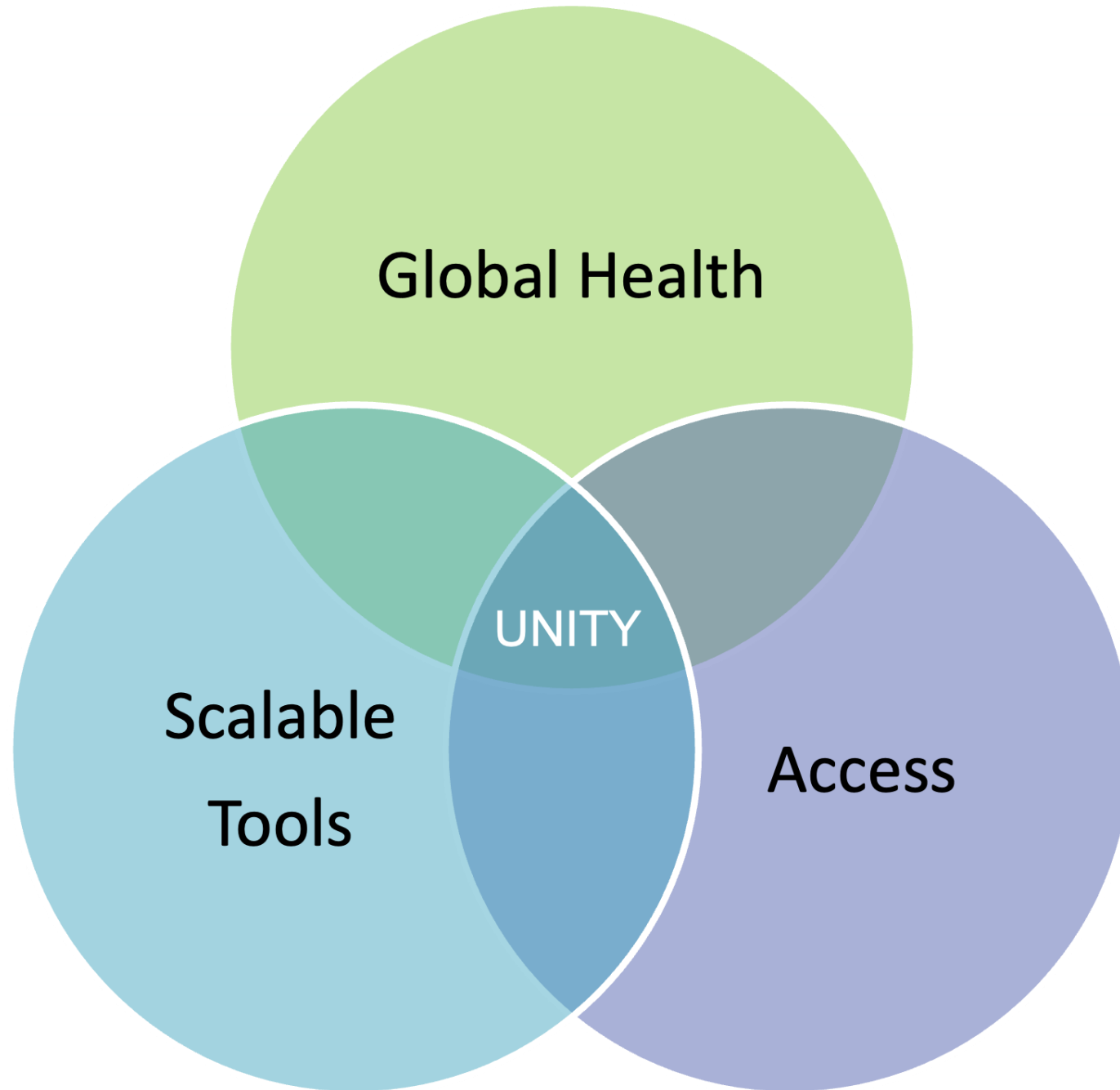


Sagittal T₂-Weighted: TE = 123ms, (5 x 1.5 x 1.5)mm³





- A) Hyperfine Swoop ultralow field point of care portable MRI (64mT).
- B) Reconstructed T2w structural scan from 31 year old female (mother).
- C) Reconstructed T2w structural scan from 3 year old infant.
- D) Reconstructed T2w structural scan from 3 month old baby.



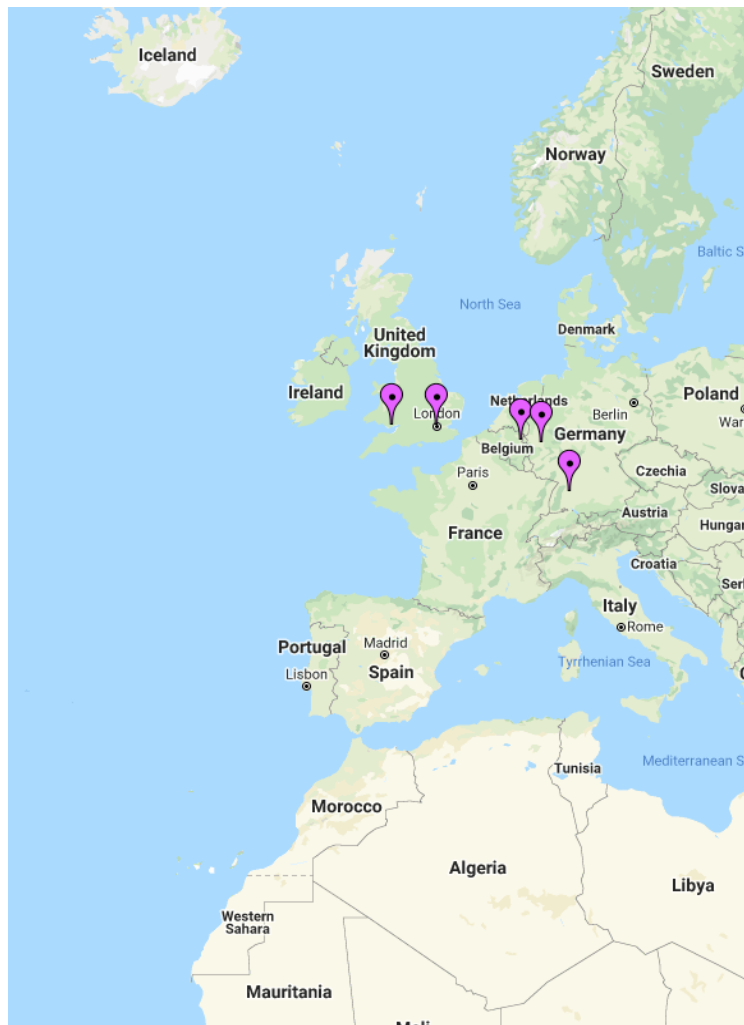
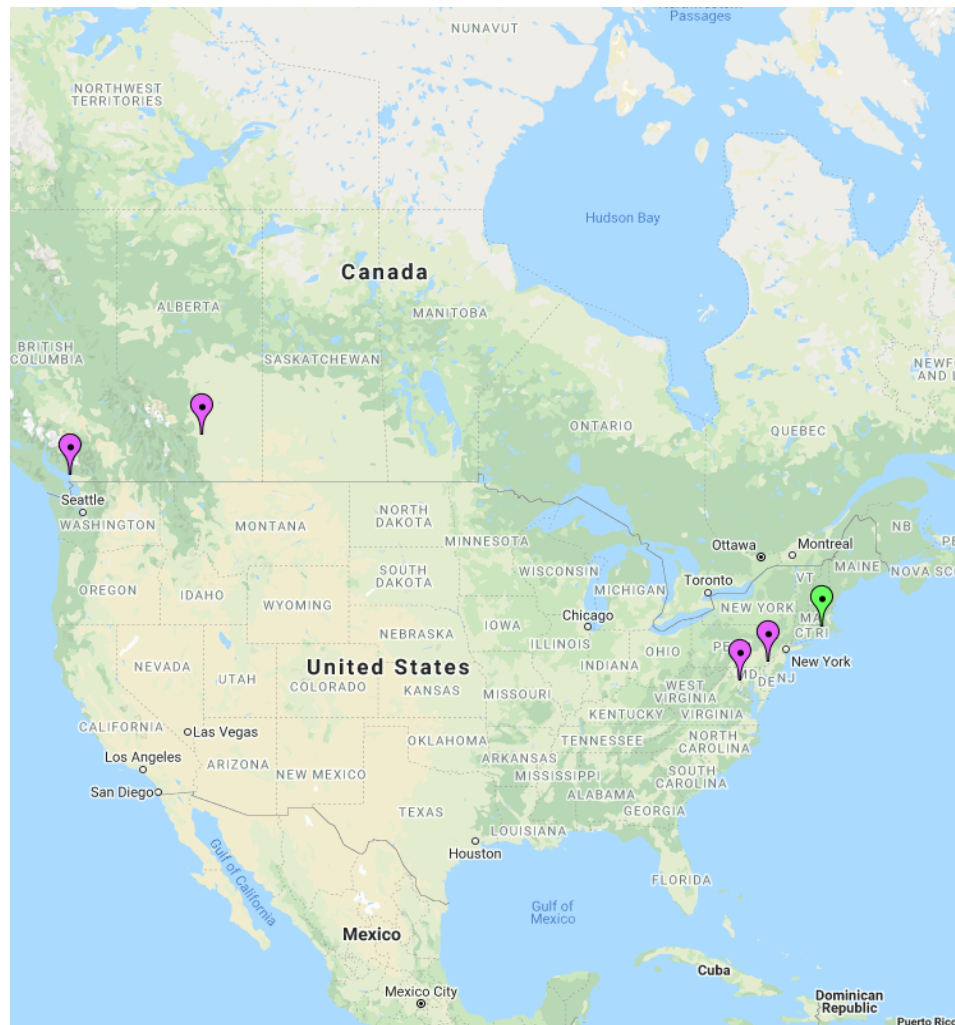
Global Health

**Scalable
Tools**

UNITY

Access

UNITY - Physics & Engineering Centres



Partner Location	Expertise
London, UK	Infant & Neonatal MRI, Motion Correction, Contrast Optimization, Quantitative MRI; AI Based Image Reconstruction
Cardiff, UK	Diffusion MRI
Bonn, Germany	Infant Ischemia
Tubingen, Germany	Rapid MRI, Functional MRI, MRI Physics
Leiden, The Netherlands	Low Field MRI Engineering & Hardware
Vancouver, Canada	Quantitative MRI, Myelin Imaging T2 Relaxometry
NIH, USA	Metabolic MRI, Diffusion MRI,
Lund, Sweden	Low Field MR Physics, Quality Control
Providence, USA	Quantitative MRI, Training

UNITY – Clinical Centres



Study Name	Study question
PRIMES (<i>Uganda</i>)	Impact of early nutrition supplementation on brain development
ENAT (<i>Ethiopia</i>)	Neurodevelopmental changes associated with early nutritional supplementation (BEP)
AKU Neurodev. (<i>Pakistan</i>); LABOR (<i>Zambia, Ghana</i>);	Neurodevelopment throughout infancy and childhood
REVAMP, EDIVA (<i>Bangladesh</i>); REVAMP TT (<i>Malawi</i>); RAPID Iron (<i>India</i>); Low-Field Iron (<i>South Africa</i>)	Evaluation of the impact of maternal anemia on infant brain development
ACTION3 (<i>Kenya, India</i>)	Evaluation of Corticosteroids following preterm birth

Training Videos



UNCRATING THE SCANN...

Claire Ferguson

How to uncrate the Hyperfine Swoop scanner on delivery (v 13/05/21)



MAGNET SAFETY

Claire Ferguson

Overview of safe handling of the Hyperfine Swoop scanner's magnet (v 28/05/21)



MOVING THE SCANNER

Claire Ferguson

How to drive the Hyperfine Swoop scanner around your premises (v 13/05/21)



PATIENT SCANNING

Claire Ferguson

Using the Hyperfine Swoop scanner to perform a patient scan (v 27/05/21)



CLEANING PROTOCOL

Claire Ferguson

How to clean the Hyperfine Swoop scanner between scans (v 28/05/21)



QA SCANNING

Claire Ferguson

Performing regular SQA tests on the Hyperfine Swoop scanner (v 28/05/21)





PILOTS

*Alfred Schlegel
Wes. Carroll*

KAY

**JEWELERS
OF AMERICA**

CUB

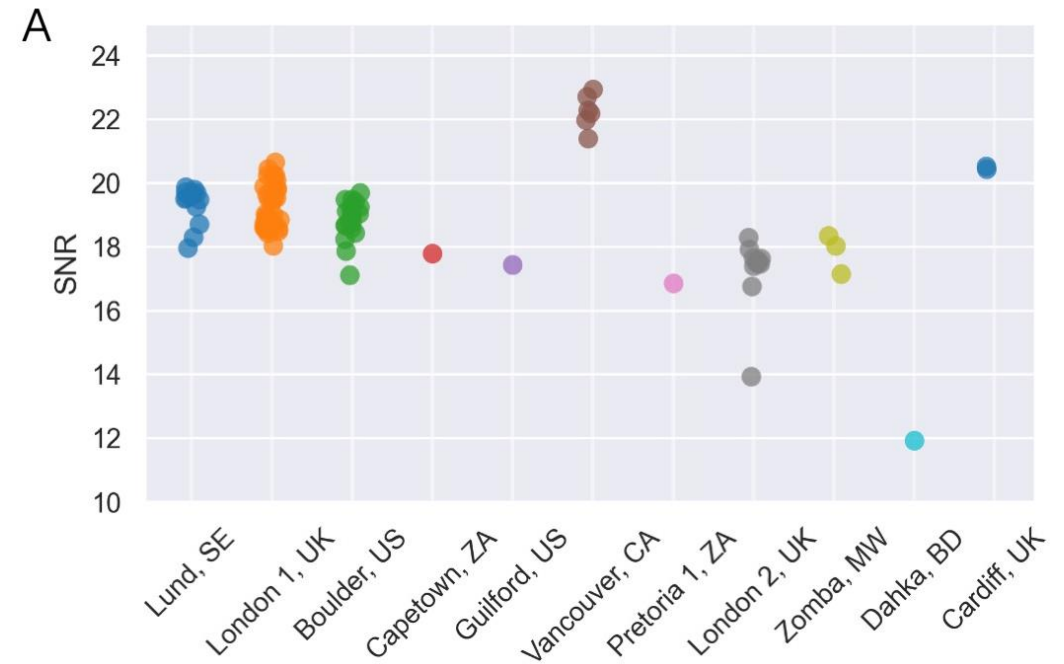
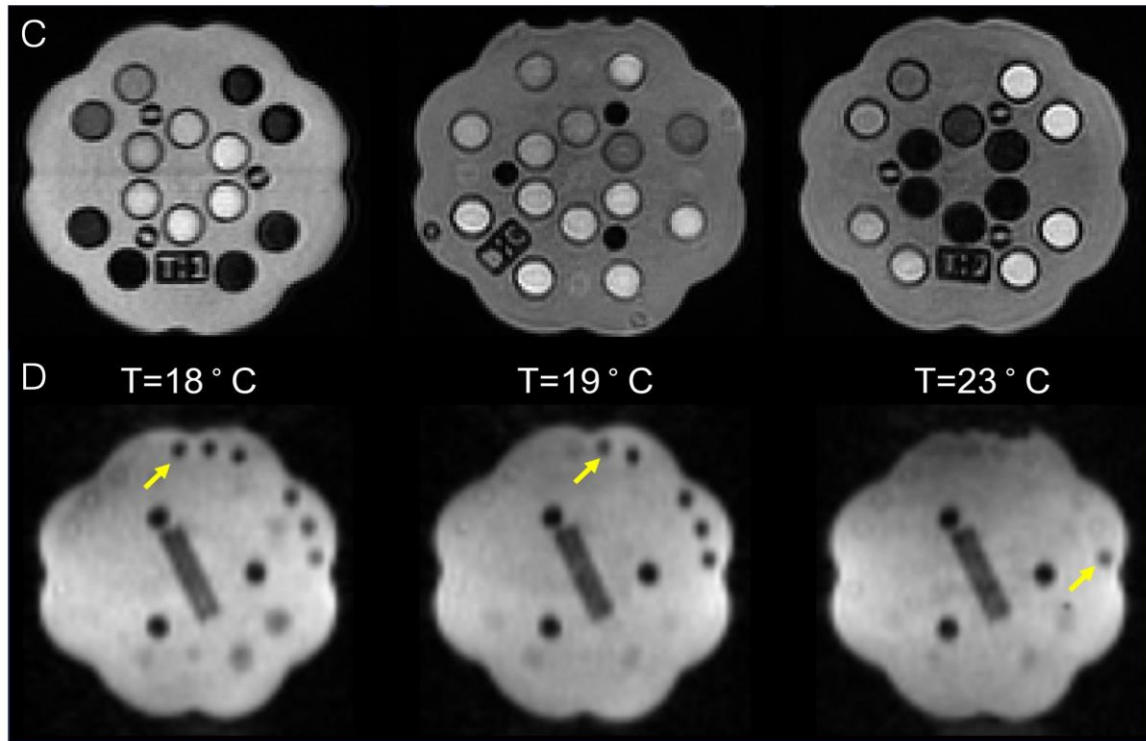
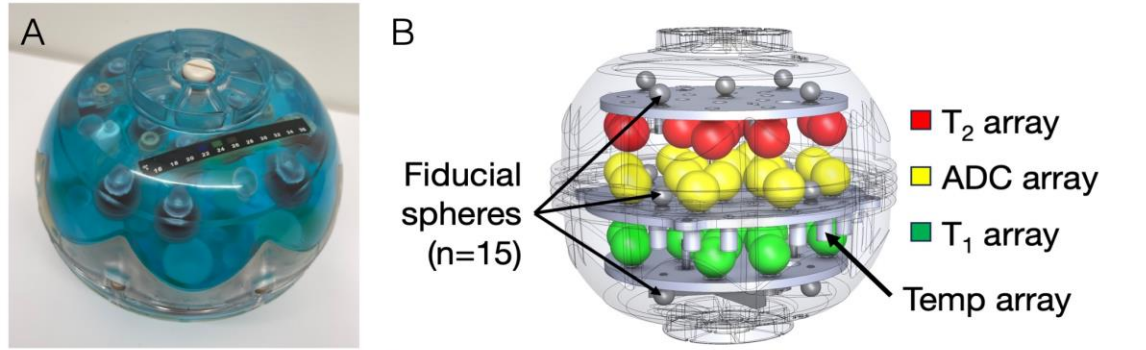
**NX
23233**

KAY

Standardisation and Quality Control



Emil Ljungberg



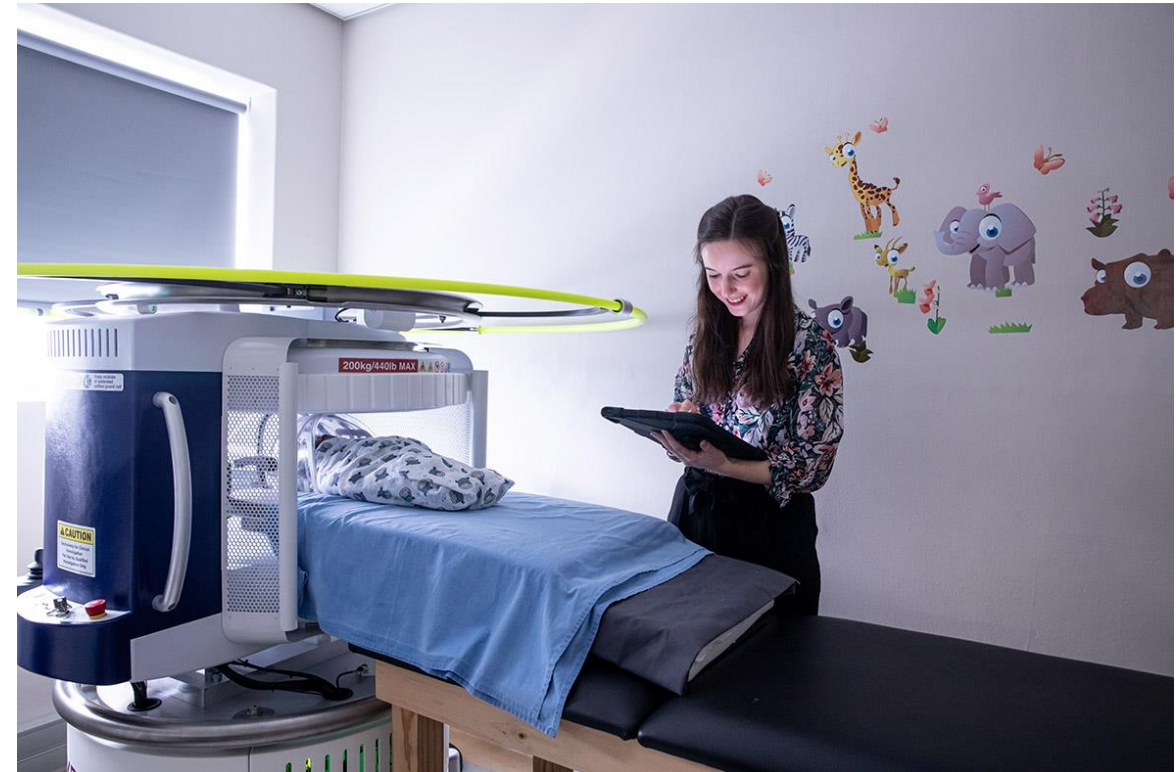
Are the images from a portable MRI system good enough?

3T MRI



64mT MRI

Jess Ringshaw & Kirsty Donald



Current Focus: Babies and children are scanned on both MRI systems

Purpose: Cross-validation - Comparing the high and low-field neuroimaging systems

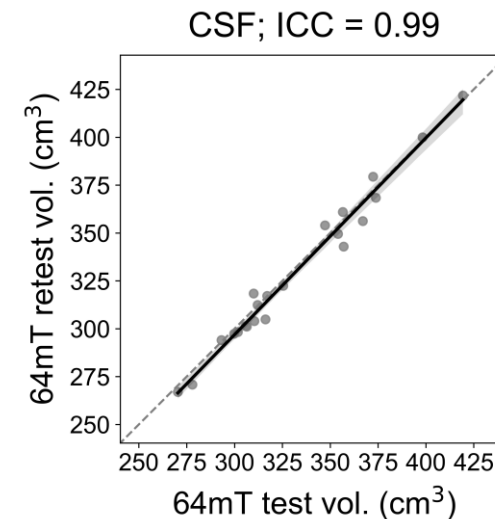
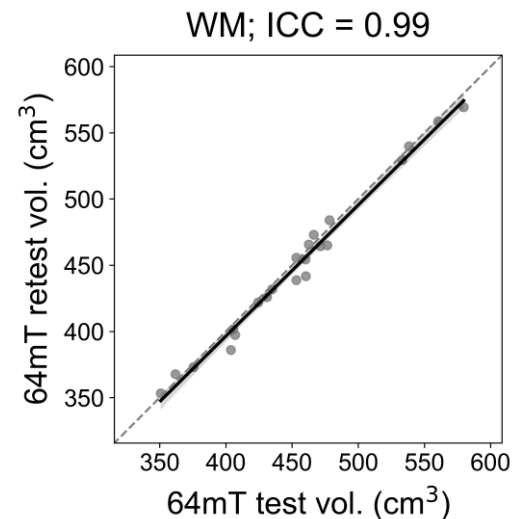
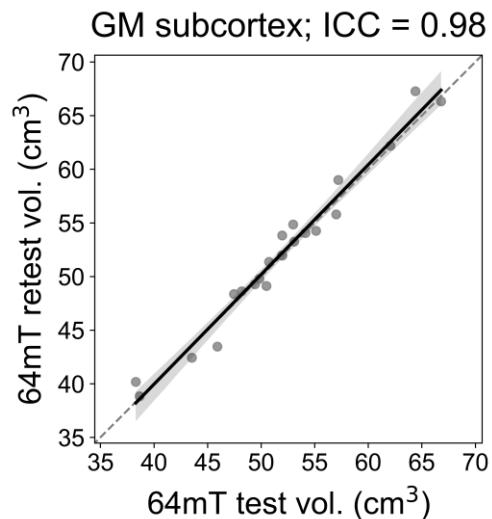
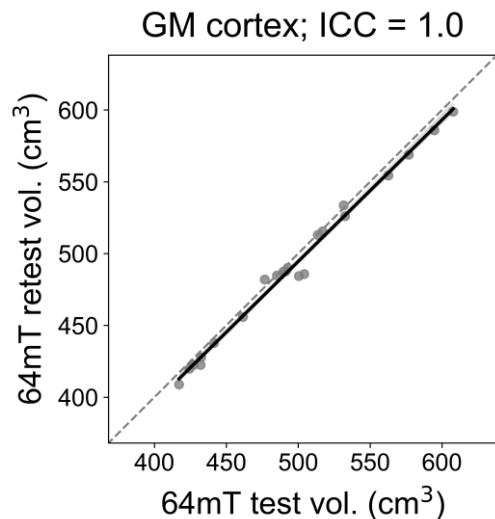
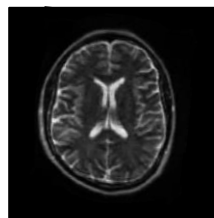
Clinical Research Question: Does the Hyperfine detect the same key findings as the 3T MRI

Test-Retest Reliability of Hyperfine 64mT ultra-low-field MRI (23 adults)

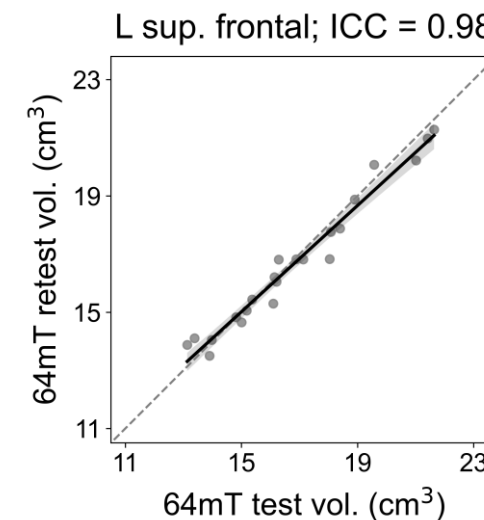
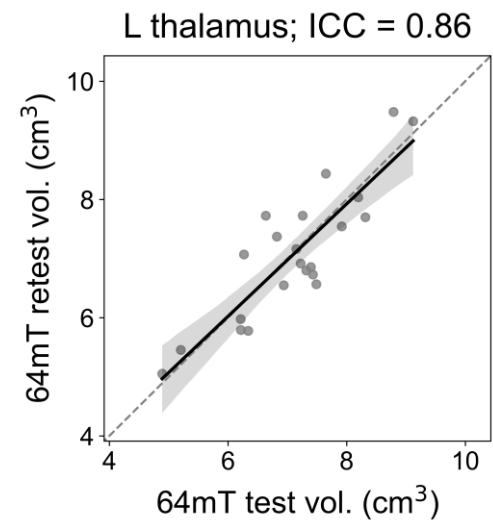
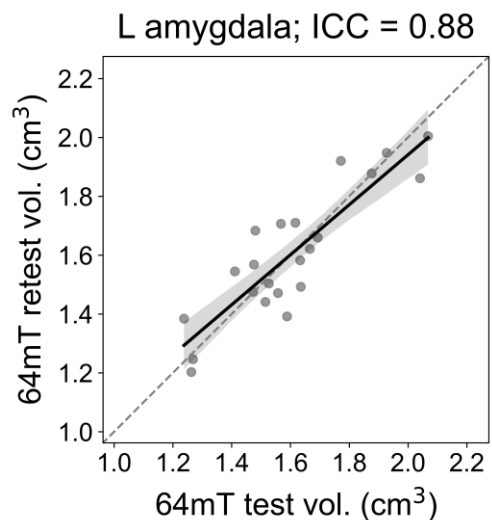
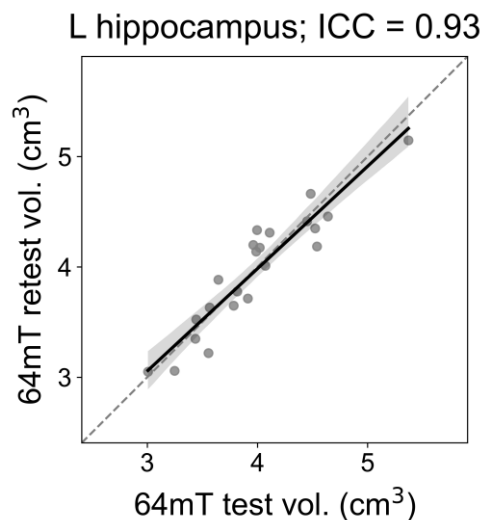


Frantisek Vasa

global

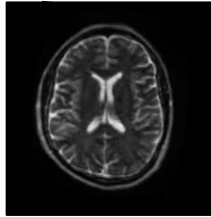
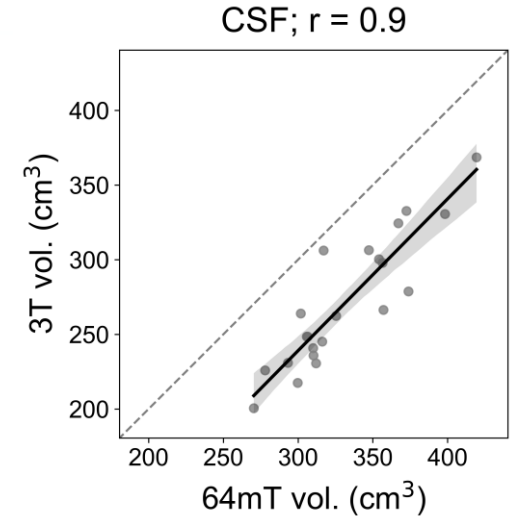
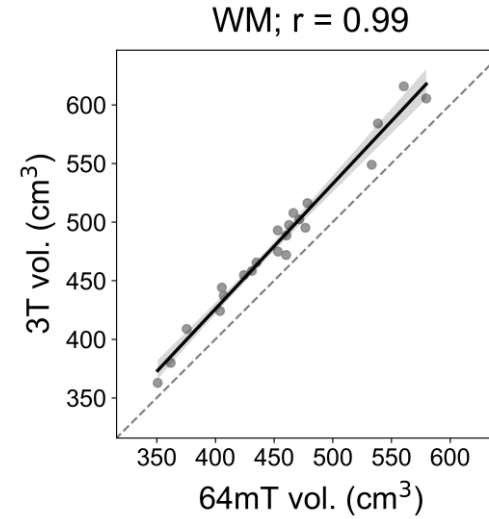
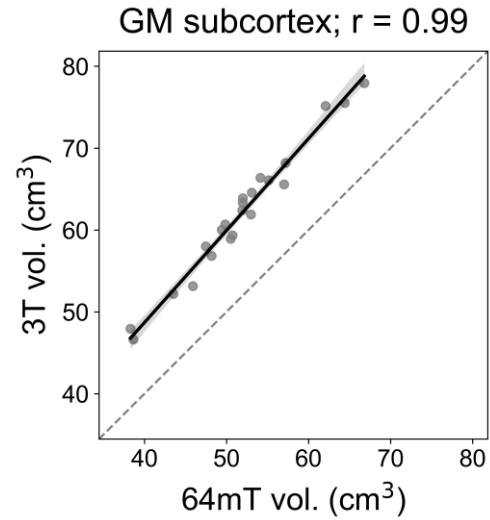
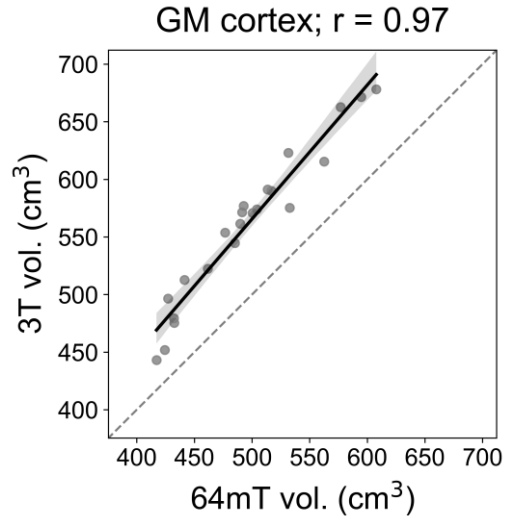
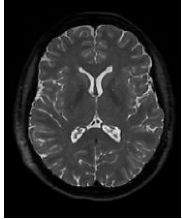


example regions

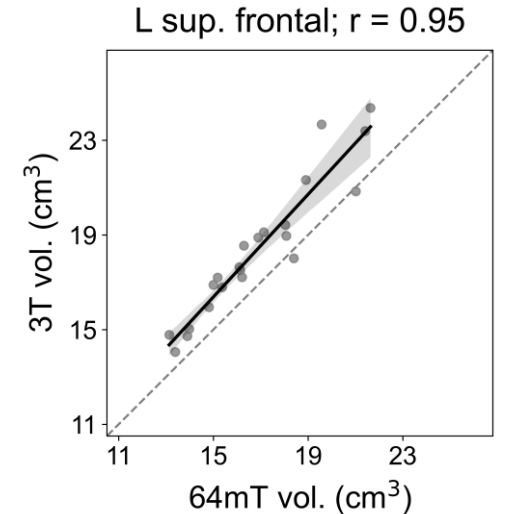
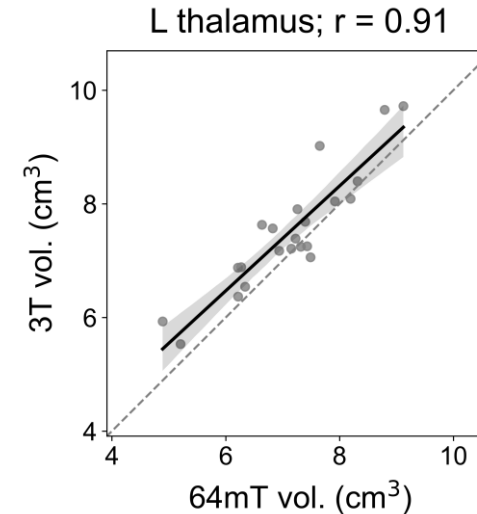
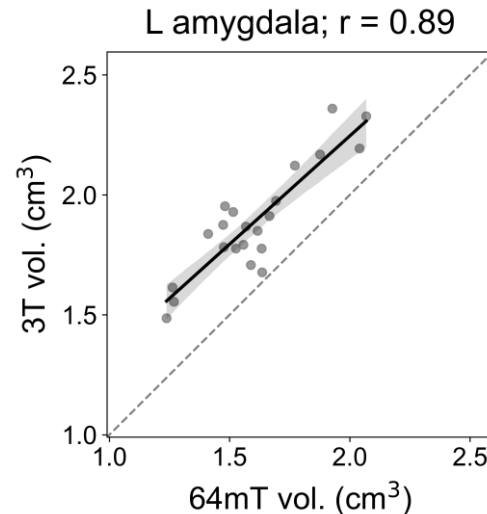
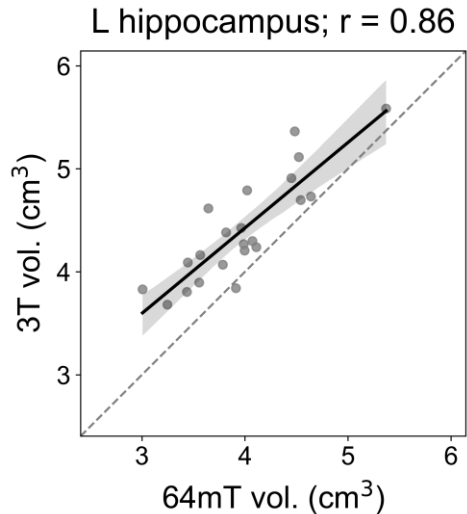


Correspondence of Hyperfine 64mT ultra-low-field to 3T high-field MRI

global



example regions



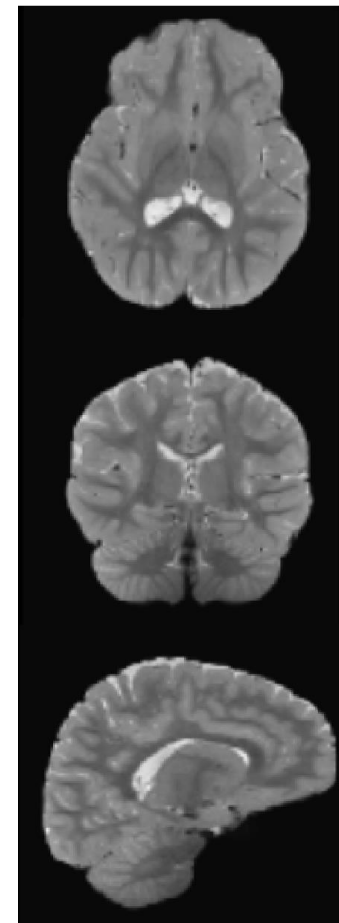
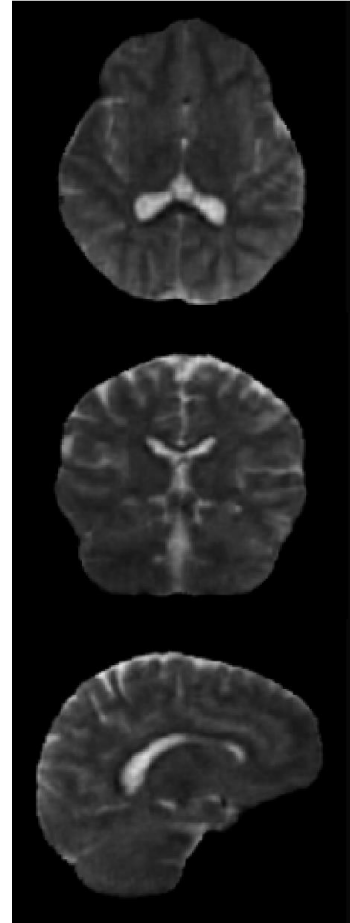




Hyperfine

3T Data

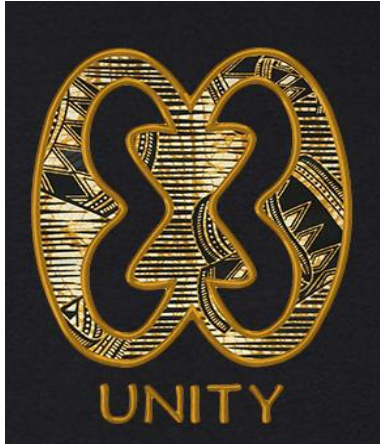
Axial
view



Coronal
view

Sagittal
view

Anaemia
Malaria
Malnutrition
HIE
Hydrocephalus
HIV
Inflammation
Ischaemia
TB



KNOWLEDGE EXCHANGE AND MENTORSHIP

ISMRRM

ONE
COMMUNITY
FOR CLINICIANS
AND SCIENTISTS





Catalogue of UNITY (and Affiliated) Studies that Include Low/High Field MRI

Location	Fetal	0-1m	1-4m	6-9m	12m	18m	24m	36m	48m	60m
Cape Town			X / X	X / X	X / X		X / X		X / X	
Johannesburg		X								
Karachi (1)			X	X	X	X	X	X	X	X
Kampala (1)			X	X	X / X					
Kampala (2)			X	X	X	X	X	X	X	X
Bahir Dar			X	X	X	X	X	X	X	X
Zomba				X	X					
Dhaka (1)				X	X					
Dhaka (2)									X	X
Kisumu			X	X	X					
CMC Vellore			X	X	X					
Lucknow				X	X	X	X	X		
Rajistan	X		X		X		X			
Lusaka			X	X	X					
Kintampo			X	X	X					
Karachi (2)			X	X	X					
Accra				X	X		X			
Bonn		X								
London		X / X								
Providence	X / X		X / X	X / X	X / X	X / X	X / X	X / X	X / X	X / X



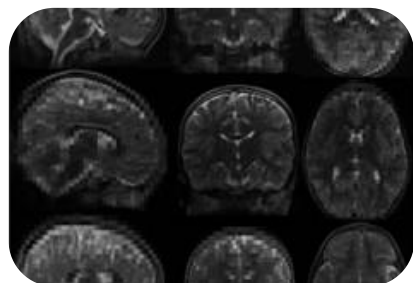


Flywheel

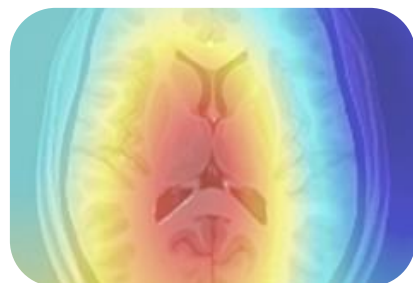
NEWLY DEVELOPED 'GEARS'



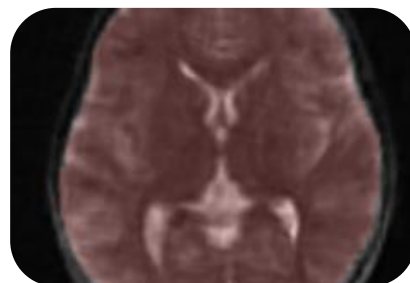
Niall Bourke



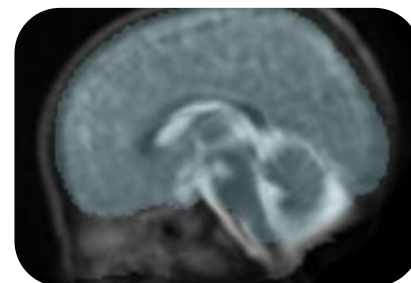
Isotropic reconstruction



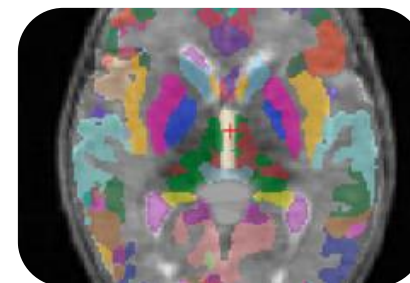
N4 Bias correction



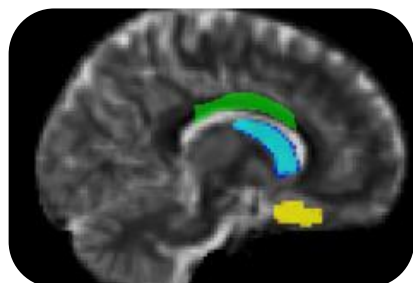
HD-BET



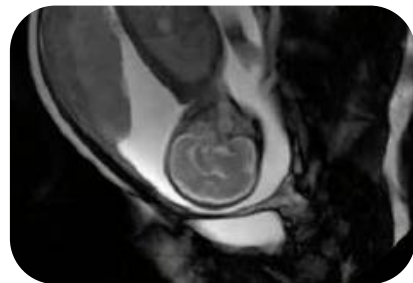
SBET



SynthSeg



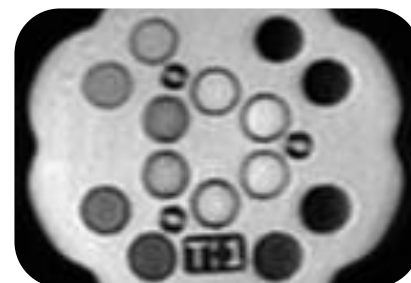
ANTs VBM



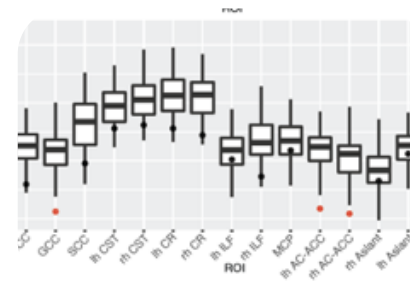
SVRTK-fetal-brain reconstruction



SVRTK-fetal-brain segmentation

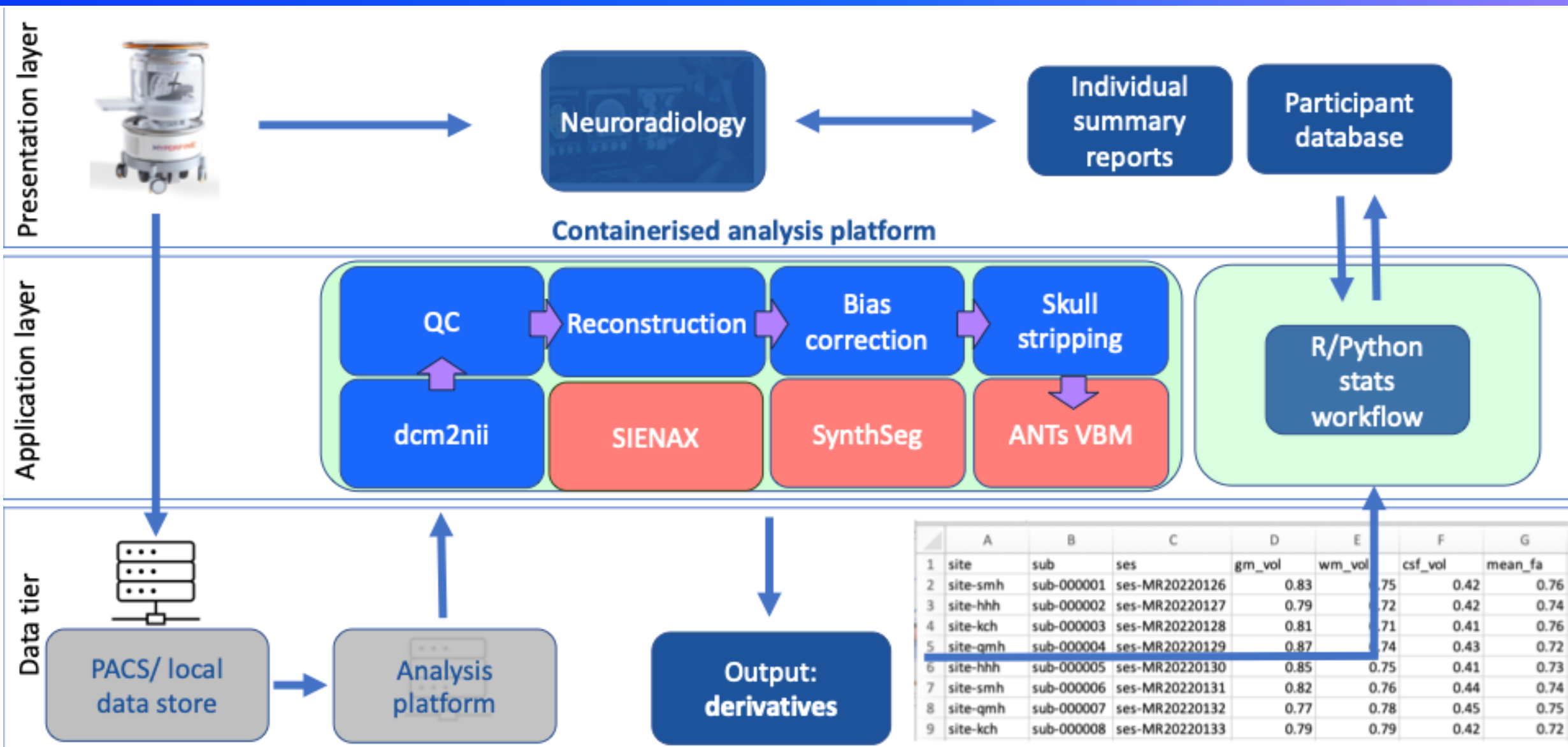


Phantom curation

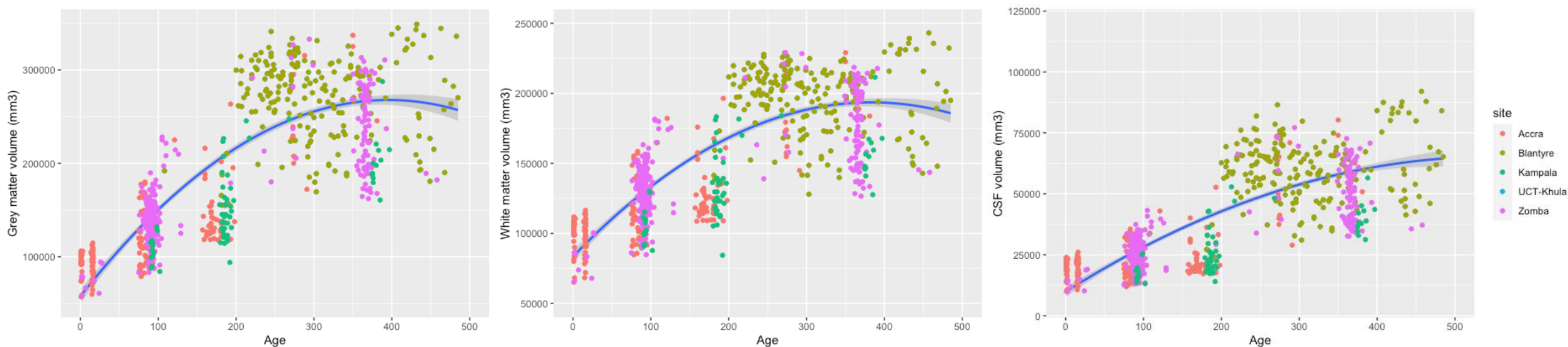


Normative modelling

ARCHITECTURAL DESIGN OF CENTRALIZED IMAGE PROCESSING



BRAIN GROWTH CURVES FROM ULTRA-LOW FIELD MRI VOLUME ESTIMATES IN SUB-SAHARAN AFRICA



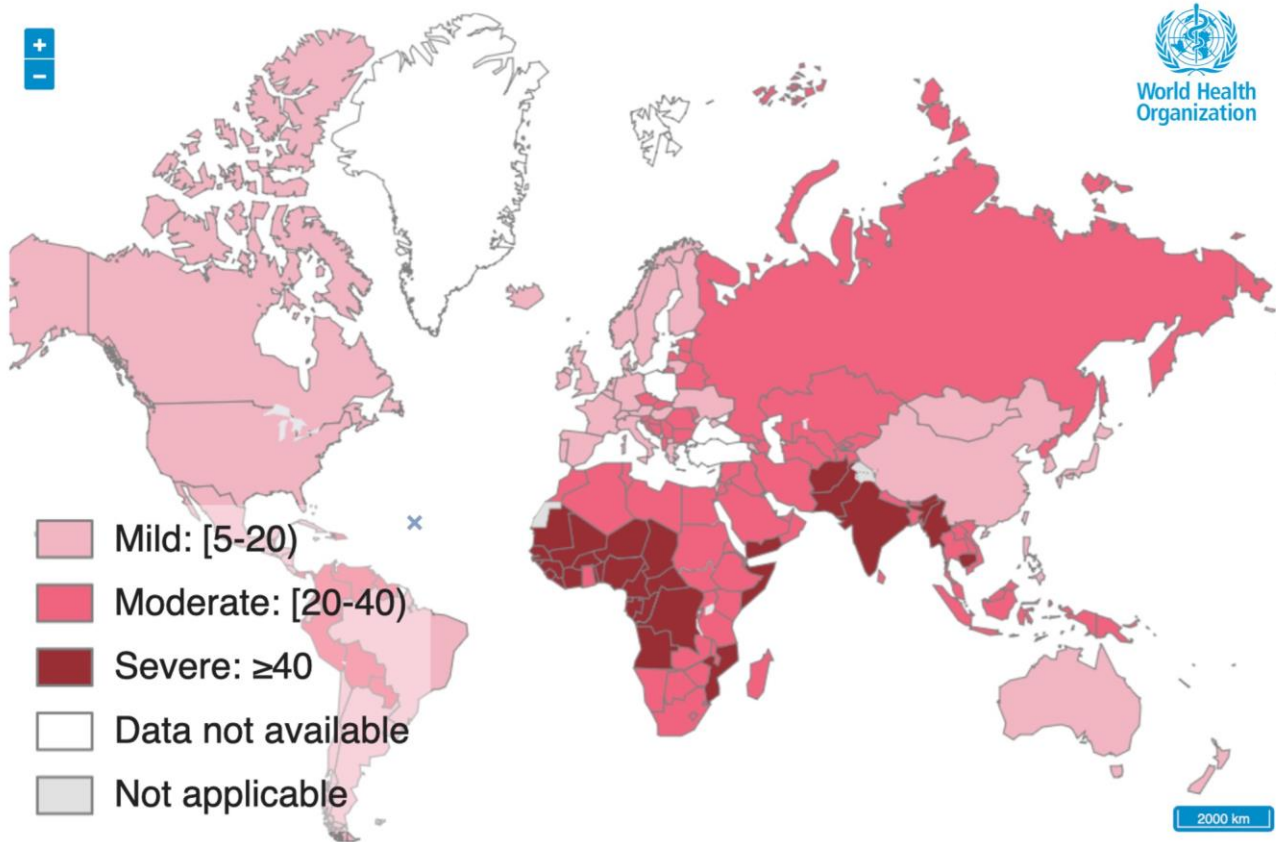
n = 1046

529 female, 517 male

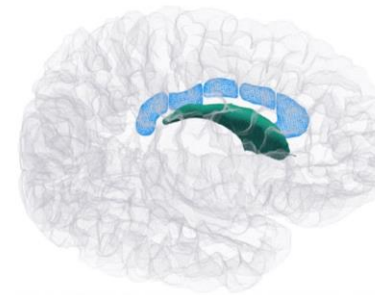
Range 1- 485 days (mean = 208)

Maternal Anaemia

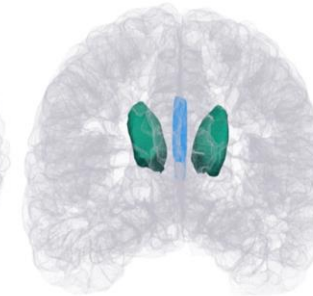
*Jess Ringshaw, Kirsty Donald
& Catherine Wedderburn*



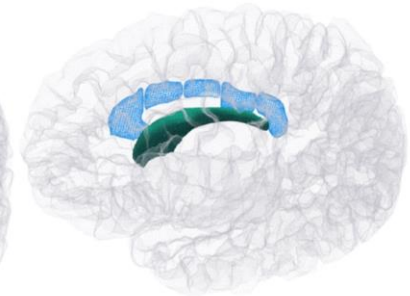
A. Lateral View (Right)



B. Coronal View



C. Lateral View (Left)



Corpus Callosum

Caudate Nucleus

Global Prevalence of Anaemia in Women of Reproductive Age (15-49 Years) Based on 2019 Estimates Published by the WHO

Buddying Beyond UNITY



Neonatal Brain MRI at St Thomas' Hospital



Francesco Padormo, Paul Cawley, Tomoki Arichi, A. David Edwards, Mary Rutherford, Jo V. Hajnal

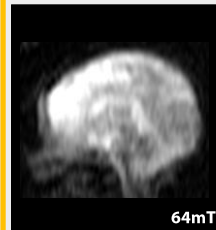
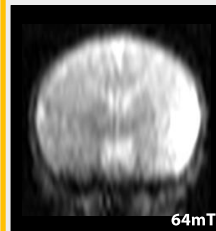
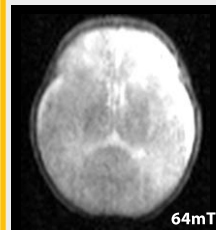
Total Neonatal Research Scans: 47 [all paired with 3T image acquisition – scanning started 23rd September]

Process:

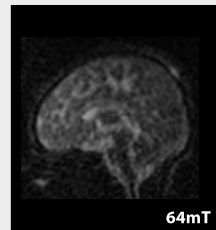
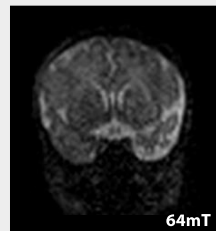
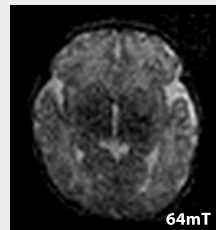


Protocol:

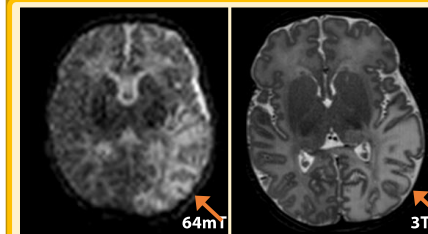
Default T2w



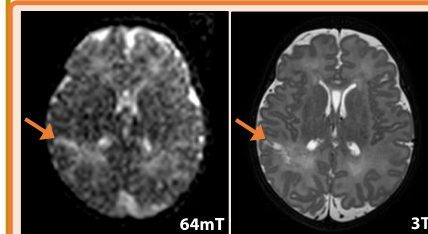
Optimised T2w



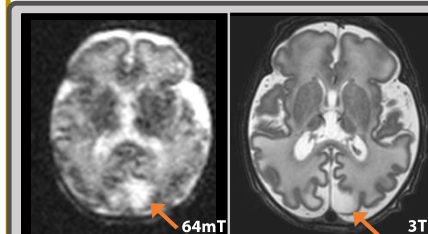
Pathology:



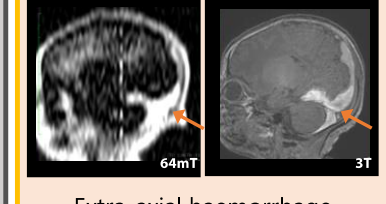
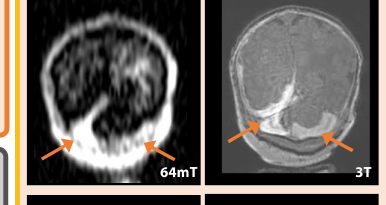
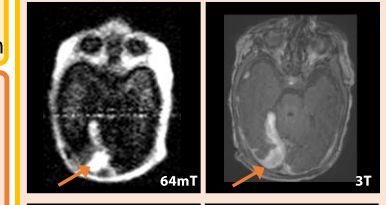
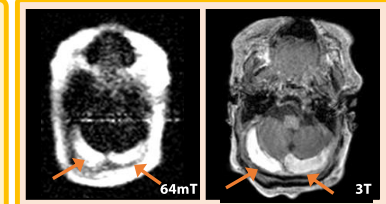
Diffuse cortical/white matter infarction



Focal cortical infarction



CSF cyst, immature gyri & abnormal signal



Extra-axial haemorrhage

Radiological Support and Education

COLLECTIVE MINDS RADIOLOGY

HOME MY CASES GROUPS COLLECTIONS NOTIFICATIONS GET HELP WORKSPACE SEAN

+ Post a new case

UNITY

This is a private group that will be used for the BMGF UNITY Neuroimaging Network.

The goals of this community are to learn from each other and share best practices, protocols, and experiences (research and clinical) with low-field MRI. This community is a resource for all sites to share images and solicit opinions and feedback in terms of data quality, image artifacts, and potential clinically-concerning and meaningful findings.

Here you can upload and share images. We acknowledge that some key images may appear suboptimal at the moment due to multiframe DICOM. An update of the platform will come shortly that will support this. All case images are still visible through review mode.

CASES 4 MEMBERS 49

swoop 5.0 POC MRI T2 (AXI) 2023-01-19

swoop 5.0 POC MRI T2-Weighted FSE (COR) 2023-01-19

swoop 5.0 POC MRI T2-Weighted FSE (SAG) 2023-01-19

- Direct and rapid feedback from community on image quality, artifacts, potential clinical indicators.
- Monthly site-specific image review sessions with experienced members to help identify systematic issues and offer ways to address them.
- Educational webinars focused on methods of imaging, MRI physics, image artifacts, etc.

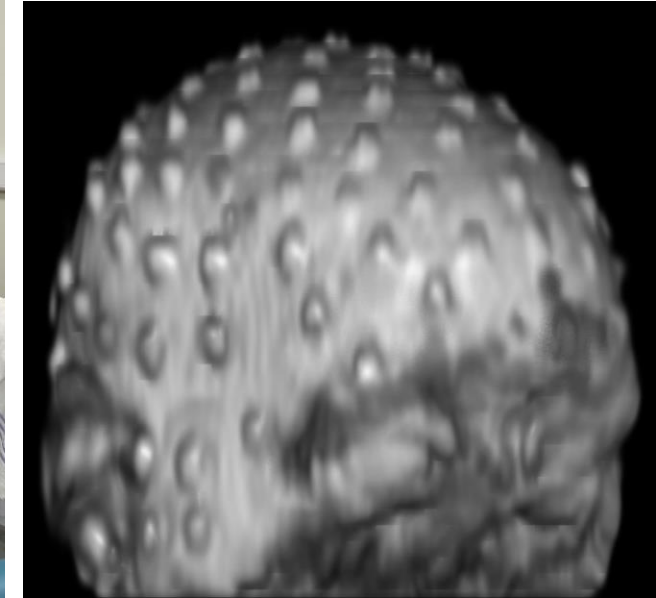
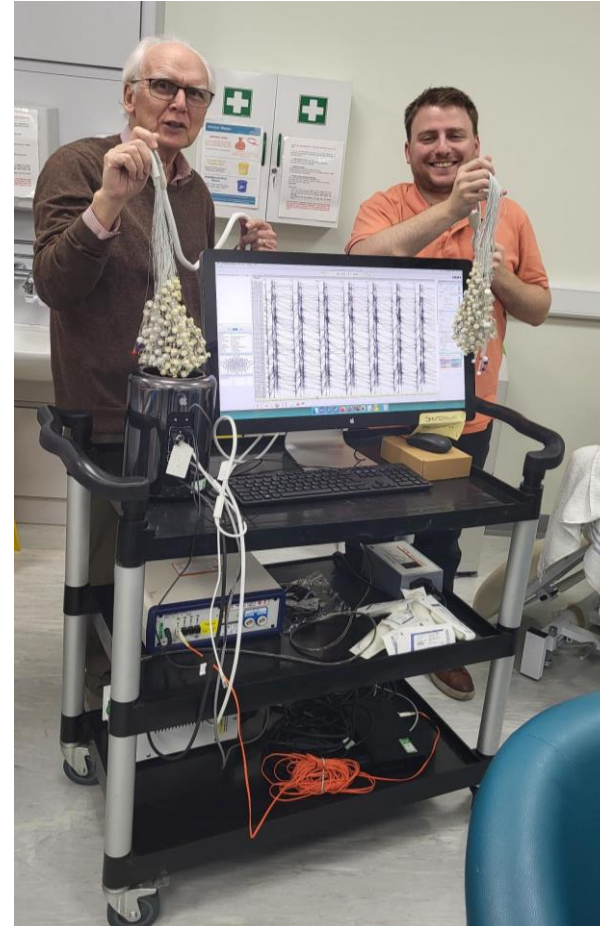
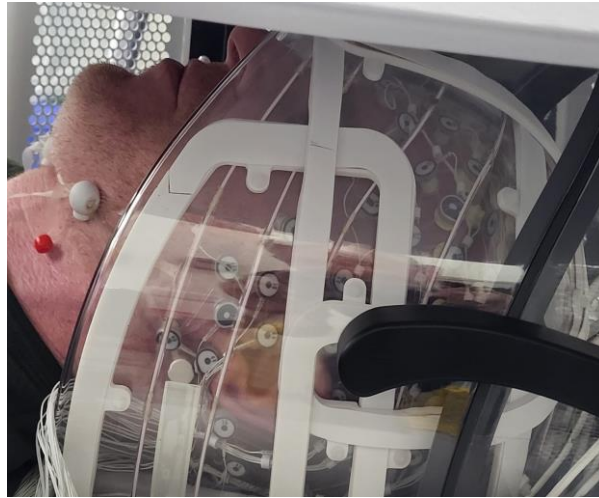
Communication

The image shows a WhatsApp interface. On the left is the 'Community' page for 'BMGF Neuroimaging Partners', which has 11 groups. Below this are options to 'Invite', 'Members', and 'Add groups'. A description states it's a general group for neurodevelopment projects. On the right is a chat window for the 'Physics & Engineering' group. The chat history includes messages from Rui Pedro Teixeira, Fran P, Heidi, and Steve, discussing scanner availability and meeting schedules. A recent message from Fran P is highlighted in green, discussing overlapping meetings. At the bottom, a message from Shannon Kolind is visible.

- Near real-time interaction with other members of the community - for troubleshooting and other questions, quick comments on data, etc

PILOT INVESTIGATION OF COMBINED EEG AND MRI ON A HYPERFINE SYSTEM

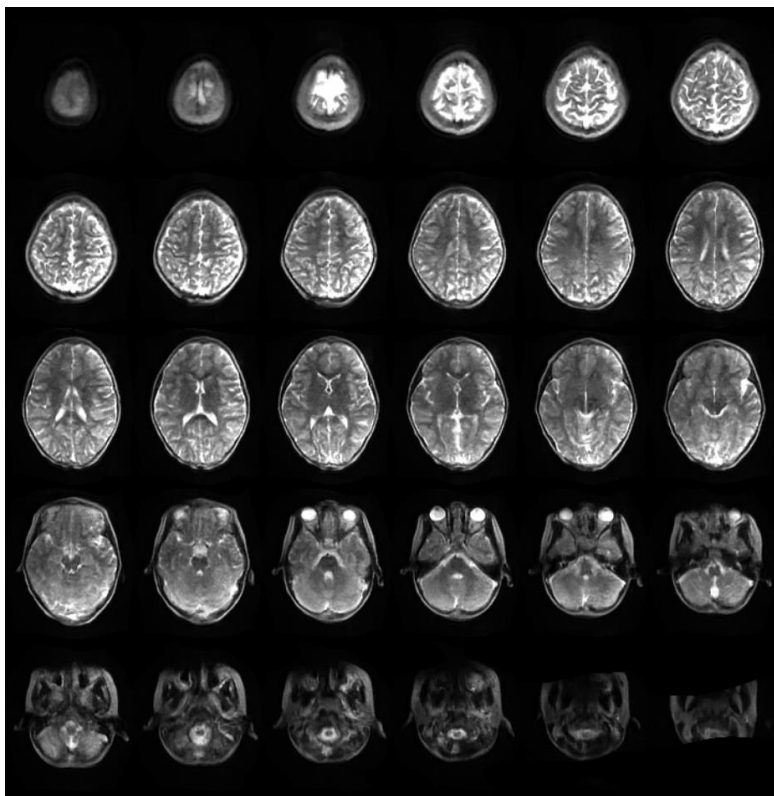
Bill Fifer & Nicolo Pini



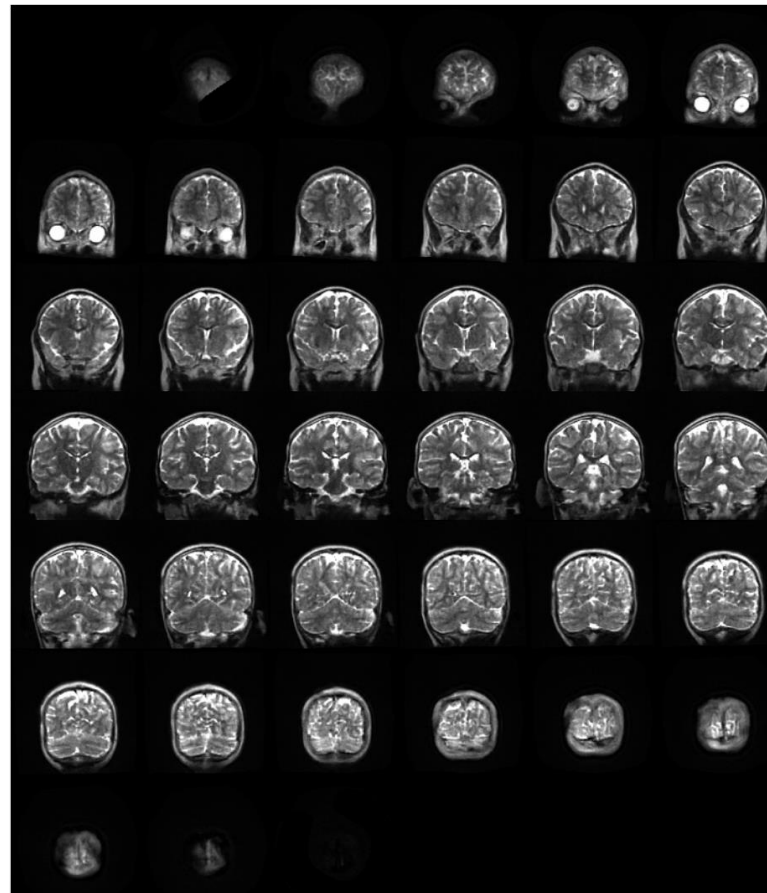


Hyperfine Data

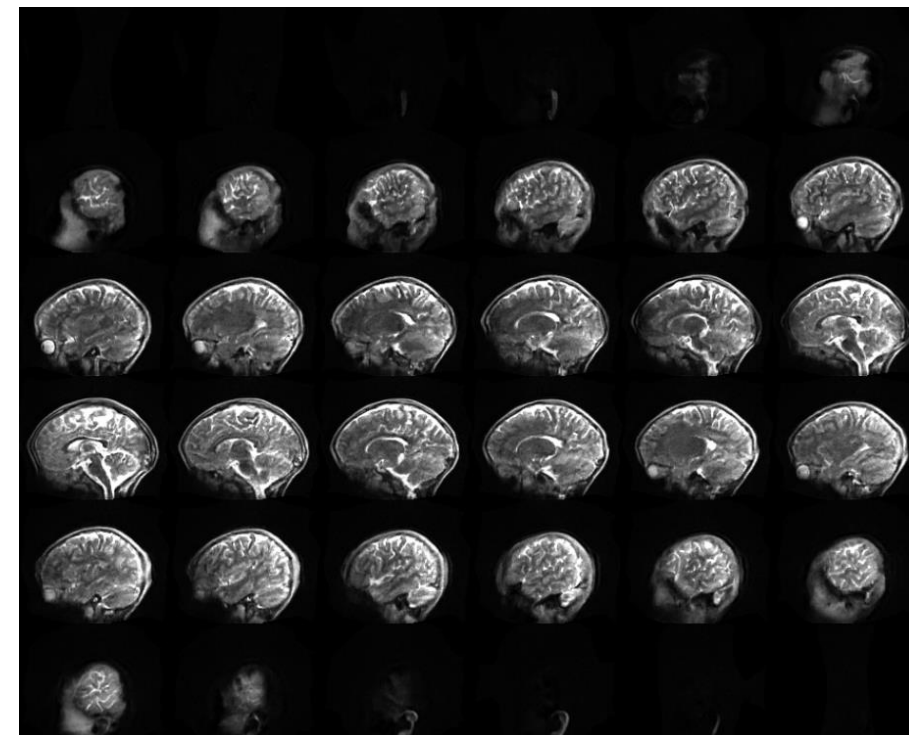
64mT: 3-year-old



T2 Axial

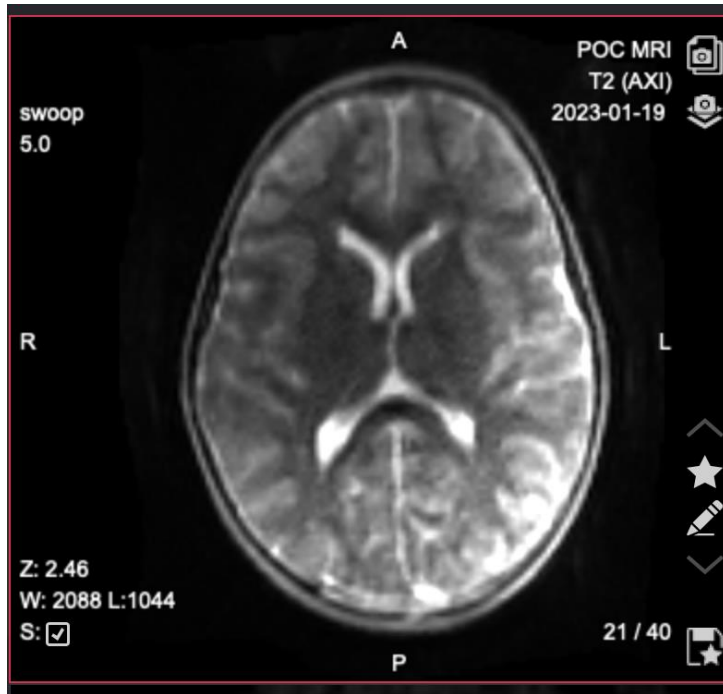


T2 Coronal

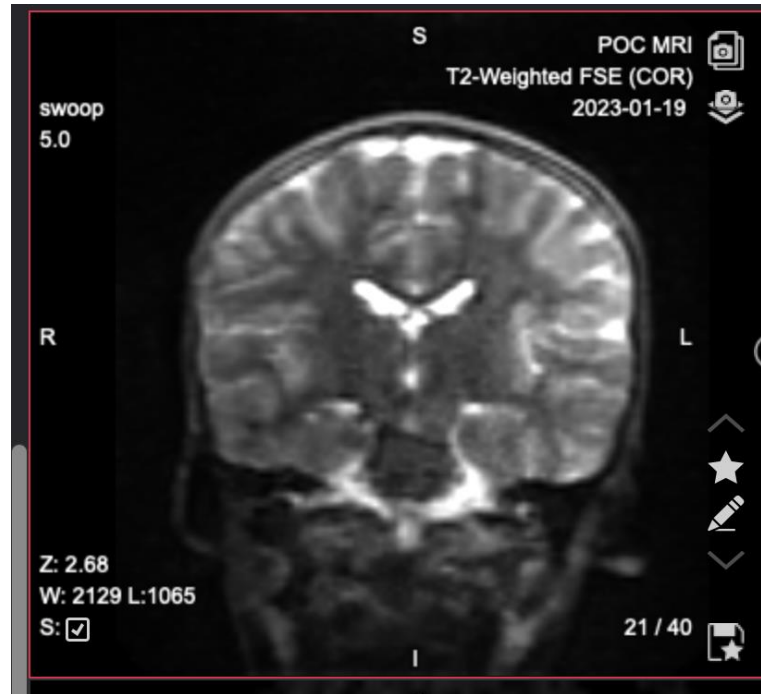


T2 Sagittal

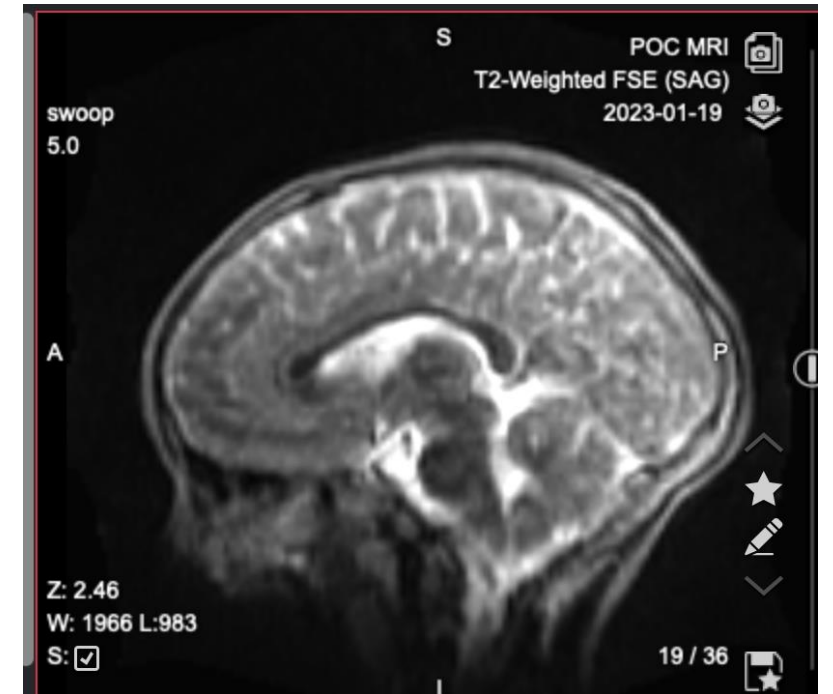
Hyperfine Data 64mT: 3-year-old



T2 Axial



T2 Coronal



T2 Sagittal

Data Management



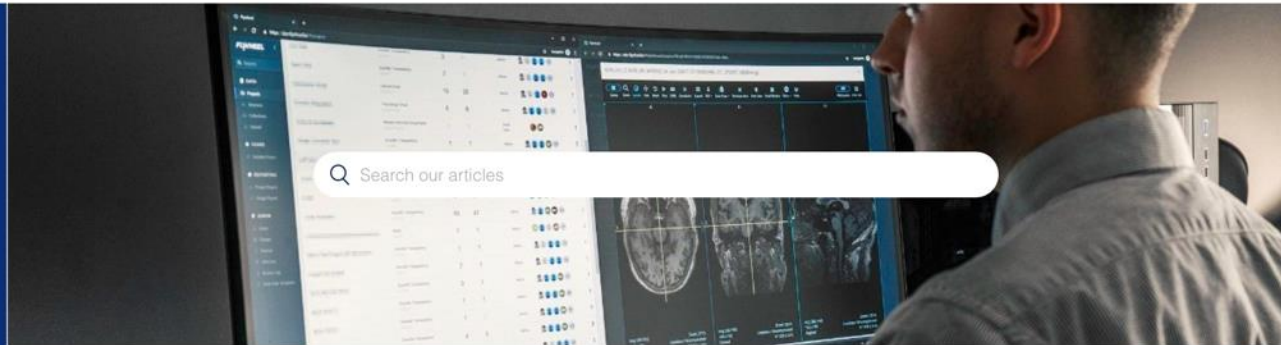
[Contact Support](#) [Sign in](#)

WHAT'S NEW

- ✓ [Welcome to Flywheel](#)
- ✓ [Announcements](#)
- ✓ [Release Notes](#)

USER GUIDE

- ✓ [Signing in](#)
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- ✓ [Viewing images](#)
- ✓ [Gears](#)
- ✓ [Gear Rules](#)
- ✓ [Task Management](#)
- ✓ [Create a config file for the fw ingest command](#)
- ✓ [Search](#)
- ✓ [Downloading data](#)



Welcome to Flywheel

[Getting started](#)

What's New

[View release notes](#)

User Guide

Learn more about how to use Flywheel to capture, compute, curate, and collaborate

Admin Guide

How-to guides for administering Flywheel

Developer Guide

Build gears and integrate Flywheel with existing tools to get the most out of your data

MATLAB SDK [↗](#)

[See our developer documentation](#)

- Secure data storage and curation site, with access limited to those you allow.
- Hosted in US and India.
- Developed harmonized processing pipelines for combining data outcomes.
- Working towards data sharing across all sites and projects where possible.
- Federated learning methods for when sharing is not possible (e.g. India data)

All sites expected to be using FlyWheel by the end of 2023.