Supplementary Materials

Brain/MINDS Beyond Human Brain MRI Project: A Protocol for Multi-level Harmonization across Brain Disorders Throughout the Lifespan

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Supplementary Table S1. Main imaging parameters of structural (T1_MPR and T2_SPC), functional MRI (fMRI) and diffusion weighted MRI (DWI) scans in HARP protocol.

Scanner (System version)	Prisma (VE11C)	Skyra (VE11C)	Verio (VD13A)	Verio (VB17A)	Trio (VB19A)
T1_MPR					
FOV(SI × AP × RL) [mm]	256 × 240 × 179.2				
Orientation	sagittal (PE dir. : A >> P)				
Matrix size	320 × 300 × 224				
Slice oversampling [%]	7.1				
Resolution [mm]	0.8 × 0.8 × 0.8				
TR/TE/TI [msec]	2500/2.18/1000				
Scan time [min:sec]	5:22				
Flip angle [deg]	8				
Acceleration	Phase partial Fourier: 6/8, GRAPPA (factor:2, ref. line:32)				
Bandwidth [Hz/Px]	220				210
Echo spacing [msec]	7.9				7.8
Sampling Spacing [μsec]	7.1				
Fat Sat	Water excit. fast				
Filter	Distortion Corr OFF, Prescan Normalize ON				
T2_SPC					
FOV(SI × AP × RL) [mm]	256 × 240 × 179.2				
Orientation	sagittal (PE dir. : A >> P)				
Matrix size	320 × 300 × 224				
Resolution [mm]	0.8 × 0.8 × 0.8				
Slice oversampling [%]	7.1				
TR/TE [msec]	3200/564		3200/565	3200/564	3200/562
Scan time [min:sec]	5:31		5:22	6:26	
Excitation	variable flip angles (Flip angle mode: T2 var)				
Turbo factor	314		326	167 (Slice turbo factor 2)	
Acceleration	GRAPPA (factor:2, ref. line:32)				
Bandwidth [Hz/Px]	744	679			781
Echo spacing [msec]	3.86		3.72		3.48
Sampling Spacing [μsec]	2.1	2.3			2.1
Filter	Distortion Corr OFF, Prescan Normalize ON, Image Filter (Sharp: Edge Enhanvement 3 & Smoothing 3)				
fMRI BOLD					
FOV(RL × AP × SI) [mm]	206 × 206 × 144				
Orientation	transverse (PE dir. : swapped alternatively btw A >> P & P >> A)				
Matrix size / Slices	86 × 86 / 60				
Resolution [mm]	2.4 × 2.4 × 2.4				
TR/TE [msec]	800/34.4				
#measurements	375				
Scan time [min:sec]	5:08				
Flip angle [deg]	52				
Acceleration	Partial Fourier: OFF, Multi-band (factor:6)				
Bandwidth [Hz/P ×]	2076				2326
Echo spacing [msec]	0.63				0.57
Filter	Prescan Normalize ON				
fMRI Spin-echo fieldmap					
FOV(RL × AP × SI) [mm]	206 × 206 × 144				
Orientation	transverse (PE dir. : swapped alternatively btw A >> P & P >> A)				

	Matrix size	86 × 86 × 60			
	Resolution [mm]	2.4 × 2.4 × 2.4			
	TR/TE [msec]	6100/60			
	Scan time [min:sec]	0:06			
	Flip angle [deg]	90/180			
	Acceleration	Phase Partial Fourier OFF			
	Bandwidth [Hz/P ×]	2076		2154	2326
	Echo spacing [msec]	0.63			0.57
	Filter	Prescan Normalize ON			
DWI					
	FOV(RL × AP × SI) [mm]	204 × 204 × 144			
	Orientation	transverse (PE dir. : swapped alternatively btw A >> P & P >> A)			
	Matrix size	120 × 120 × 84			
	Resolution [mm]	1.7 × 1.7 × 1.7			
	TR/TE [msec]	3600/79.0	3600/89.0		3600/94.0
	Scan time [min:sec]	3:29 (AP) 3:32 (PA)	4:50 (AP) 4:54 (PA)		
	Flip angle [deg]	90/180			
	Acceleration	Partial Fourier: 6/8, Multi-band [factor: 3]	Partial Fourier: 6/8, GRAPPA (ref line 36) Multi-band [factor: 3]		
	Bandwidth [Hz/Px]	1984	1544	1436	1736
	Echo spacing [msec]	0.62	0.74	0.78	0.70
	Filter	Prescan Normalize ON			
	b-values [s/mm^2]	0/700/2000			
	Diffusion direction	5/16/32 (AP) 6/16/32(PA)	7/20/40(AP) 8/20/40(PA)		
	Diffusion scheme	Monopolar			

Supplementary Table S2. Traveling subject project protocol.

Site	Protocol for target population	Additional protocol for TS	HARP additional measurement for TS			Other TS measurement sites[a]		Total number of CRHD and HARP measurements
			10-min additional rsfMRI	QSM	ASL	Hub site		
UTK	CRHD	HARP, SRPB (Prisma 64-ch head coil)	✓	✓	✓	UTI	UHI	7
UTI	CRHD	HARP, SRPB (GE MR750W)	✓	✓	✓	UTK, ATR		8
ATR	CRHD	HARP (Prisma, Verio), SRPB (Prisma, Verio)	✓	✓	✓	UTK	SWA[2]	8
FUM	HARP	NA	✓	✓	✓	UTK	SWA, NCNP	6
TMG	HARP	SRPB	✓			UTK	SWA, UHI	6
SWA	HARP	NA	✓	✓	✓	UTK, UTI		6
	HARP	SRPB (Verio)[b]	✓	✓	✓	UTI		5
NCNP	HARP	SRPB	✓		✓	UTK	JTD, FUM	6
JTD	HARP	CRHD	✓			UTK	NCNP, UKY	6
UOS	HARP	CRHD, SRPB (Trio Tim)	✓	✓	✓	ATR	UKY, TMG	6
UHI	HARP	SRPB (Verio)[c]	✓	✓	✓	UTK	NCNP, SWA	6
UNG	HARP	NA	✓			UTK	TMG, NCNP	6
UKY	HARP	NA	✓	✓	✓	ATR	UOS, NCNP, JTD	6
KRC	HARP	NA	✓			ATR	UKY, UNG	6

Abbreviations: TS, traveling subject; rsfMRI, resting state functional MRI; QSM, quantitative susceptibility mapping; ASL, arterial spin labeling; UTK, The University of Tokyo ECS (Komaba Campus); UTI, The University of Tokyo IRCN; FUM, Fukushima Medical University; TMG, Tamagawa Academy & University; SWA, Showa University; NCNP, National Center of Neurology and Psychiatry; JTD, Juntendo Hospital; ATR, Advanced Telecommunications Research Institute International; UOS, Osaka University; UHI, Hiroshima University; UNG, Nagoya University; UKY, Kyoto University; KRC, Kyoto University Kokoro Reserch Center; IR, Innovative Research Group in Brain/MINDS Beyond; BM, Brain/MINDS project; CRHD, Human Connectome Studies Related To Human Disease protocol; HARP, HARmonized protocol; SRPB, Strategic Research Program for Brain protocol (for previous multicenter study projects).

a In the hub site(s), participants were measured using Prisma CRHD and HARP protocols. We planned the measurements in other sites per site, considering the feasibility of measurement (project, machine, location, availability, etc.) and the mixture of the pairs between measurements.
b The participants who were measured using Verio SRPB in Showa University before a machine upgrade participated in the measurements.
c Some of the participants were measured using Verio SRPB in Hiroshima University, and Prisma CRHD and HARP in Advanced Telecommunications Research Institute International since the machine in Hiroshima University had been upgraded before the project started.