

Appendix

Appendix A1: Search Strategy Of Pubmed.

1. "Stroke[mesh]" OR stroke* [tiab] OR "brain infarction" [tiab] OR "cerebral infarction" [tiab] OR "cerebral infarctions" [tiab] OR "ischemic stroke" [tiab] OR "cerebral stroke" [tiab] OR "cerebral anoxia" [tiab] OR "cerebral hypoxia" [tiab] OR "brain ischemia" [tiab] OR "acute stroke" [tiab] OR "cerebrovascular accident" [tiab] OR "cerebrovascular accidents" [tiab] OR "brain venous infarction" [tiab] OR "brain vascular accident" [tiab] OR "brain vascular accidents" [tiab] OR apoplex* [tiab] OR "cerebrovascular stroke"[tiab]

2. "Rehabilitation[mesh]" OR "stroke rehabilitation" [tiab] OR recovery* [tiab] OR improve* [tiab] OR rehabilitat* [tiab] OR regain* [tiab] OR heal* OR restor* [tiab] OR "motor recovery" [tiab] OR "motor performance" [tiab] OR "cognition recovery" [tiab] OR "somatosensory recovery" [tiab] OR "somatosensory rehabilitation" [tiab] OR "language recovery" [tiab] OR "speech recovery"[tiab] OR "speech fluency" [tiab] OR "communication recovery"[tiab]

3. Recovery biomarker" [tiab] OR (recovery AND biomarker) OR "recovery marker" [tiab] OR "brain biomarker" [tiab] OR "brain marker" [tiab] OR "motor biomarker" [tiab] OR "motor marker" [tiab] OR "neuroimaging biomarker" [tiab] OR "neuroimaging marker" [tiab] OR "functional biomarker" [tiab] OR (language AND marker*) OR (cognition AND marker*) OR (sensory AND marker*) NOT (diagnos* AND biomarker) NOT (prognos* AND biomarker)

4. (#1) AND (#2) AND (#3)

Appendix Table 1: Publication, population, intervention and outcome characteristics studies.

	Author	Year	Country	Total participants (N)	Case	Control	Type of bio-marker	Intervention	Method for intervention	Outcome
1	Rosso et al.	2013	France	22	8	14	Motor	CST damage, Functional connectivity, ipsilesional corticocerebellar connectivity	FA, fMRI	NIHSS= 1.7 (IQR-1-3), Grip strength = 1.18, EHI quotient: [case=0.89, control=0.82]
2	Barker et al.	2012	Australia	39	28	11	Motor	Corticospinal integrity contralateral MEP	TMS	UE-MAS: [case=1, control=6]
3	Bradnam et al.	2012	New Zealand	24	12	12	Motor	Corticospinal integrity	FA	UE-FM = 44±15.63, Ashworth scale for BB = 1±1.37, ARAT = 39±15.50, Handedness quotient = 0.93±0.03
4	Frias et al.	2018	Canada	16	8	8	Motor	Lesion load in CST	fMRI	NIHSS=3.85±1.78, CMSA: [Arm=4.62±5.95, hand=4.2±4.61, leg=5.62±5.93, foot=3.8±3.9]

5	Findlater et al.	2019	Canada	149	149	178	Motor	Lesion volume	FA	BIT = 141±7, Purdue peg-board=7.3±4.9, FIM=120.6±8, CMSA =86/18/20/6/14/3/2 for 7/6/5/4/3/2/1
6	Dhamoon et al.	2018	United States of America	1291	247	1044	Cognition	White matter hyperintensities volume	MRI	MMSE
7	Chen et al.	2019	China	63	31	32	Sensory	Functional connectivity	FA	Somatosensory scores=27.65 ± 3.02
8	Mang et al.	2015	Canada	35	24	11	Motor	CST damage, L-iSP mean, NL-iSP mean	MRI	FM=40.8±21.9, WMFT=33.4±21.2
9	Daly et al.	2014	United States of America	34	23	11	Motor	voxel count, signal intensity change, Laterality Index	fMRI	AMAT SCORE=1636.63±668.42
10	Aminov et al.	2017	Australia	38	19	19	Cognition	Relative Power	EEG	MoCA =21.57±4.64(12-29)
11	Kimberley et al.	2006	Mongolia	14	7	7	Sensory	Voxel count, Laterality Index	fMRI	MMSE = 29±0.78
12	Dong et al.	2012	Australia	28	15	13	Cognitive and Motor	Ocular system	Visual guided saccades, volitional saccades (memory guided saccades)	NIHSS=1.2(0-2), MMSE: [Case=28.5, Control=29.6], DASS: [Case=9, control=0.9]
13	Linderberg et al.	2010	United States of America	20	10	10	Motor	Size CST LL, White Matter Damage	MRI	UE FM: [case=40.9±11.7, control=44.13±11.5], WMFT: [case=0.78±0.46, control=0.73±0.49]
14	Borich et al.	2012	Canada	26	13	13	Motor	Motor sensory regions of corpus collosum(cc), Posterior limb of the internal capsule (PLIC)	MRI	MMSE=29.15±0.99, FM=52.31±13.44, WMFT=2.45±1.56, Grip strength=18.94±9.17
15	Hsu et al.	2013	Taiwan	12	6	6	Motor	Active Motor Thresholds, Motor evoked potential	ECR, Magnetoencephalography	NIHSS=5.2±1.2, MRS=3.2±0.4, UE-FMT=37±12.4, ARAT=14.3±7.2
16	Ray et al.	2020	Germany	40	16	14	Motor	Lesion size, Lesion dimensions, alpha oscillations	EEG values	FMA=12.22±8.82
17	Blicher et al.	2015	Denmark	41	21	20	Motor	GABA in primary motor cortex	MRS	WMFT=51.38±13.65
18	Marshall et al.	2000	United States of America	14	8	6	Motor	Laterality Index	fMRI	Mvt rate=9.5±6.65
19	Cramer et al.	2005	United States of America	31	17	14	Motor and sensory	Laterality Index	fMRI	FM: [case=64, control=66], NIHSS: [case=1, control=0], Purdue pegboard: [case=9±4.4, control=14±2.5]

20	Fujii et al.	2003	Japan	45	45	30	Motor	Brain Activation	fMRI	Functional recovery
21	Zemke et al.	2003	United States of America	35	21	14	Motor	Laterality Index	fMRI	FM (left): [case=66, control=62], FM (right): [case=66, control=63.5], Peg-board (left): [case=0.67, control=0.93], Pegboard (right): [case=0.86, control=0.93]
22	Carey et al.	2005	Australia	19	9	10	Motor	Regional cerebral blood flow	MRI	ARAT=35.1±23.1
23	Loubinoux et al.	2007	France	18	8	10	Motor	fMRI Motor activation	fMRI	FT=28.3±15.7, Dynometer=29.55±14.38
24	Mintzopoulos et al.	2009	United States of America	16	5	11	Motor	Functional Connectivity	fMRI, MR-CHIRIOD	Functional recovery
25	Jie lu et al.	2011	China	22	11	11	Motor	Functional Connectivity	fMRI	FM=92.6±14.17, FMC=5.5±1.2
26	Murase et al.	2004	Madagascar	17	9	8	Motor	Interhemispheric Inhibition	TMS	MAS= 2.4±1.7, MRS=2.9±1.3, MRC Scale=3.4±0.7
27	Dubovik et al.	2013	Geneva	39	20	19	Motor and Cognitive	Functional Connectivity	EEG	Composite motor score
28	Siegel et al.	2016	United States of America	127	100	27	Motor and Cognitive	Functional Connectivity, Lesion topography	MRI, fMRI	-
29	Sullivan et al.	2004	UK	55	36	19	Cognitive	Diffusion tensor MRI	MRI	MMSE, WAISR, providing verbal IQ (vocabulary, comprehension, and similarities subtests) and performance IQ, WCST, WMS, Benton facial recognition test, FT

Appendix Table 2: Reported markers and their association with the recovery.

#	Recovery Biomarker	Positive association	Negative association	No Association
MEP				
1	MEP onset		Barker 2012 (N= 39)	
2	MEP amplitude	Barker 2012, Murase 2004 (N= 56)		
3	MEP area	Bradnam 2012 (N=24)		
4	Selectivity ratio	Bradnam 2012 (N=24)		
Laterality				
5	Laterality index	Linderberg 2010, Daly 2014, Marshall 2000, Cramer and Crafton 2006 (N=129)		
6	Laterality change	Ray 2020 (N=40)		
Cortico spinal tract				
7	Weighted CST lesion load		Frias I 2018 (N=16)	
8	CST damage	Rosso 2013 (N=22)		
9	Functional markers		Frias I 2018 (N=16)	

Brain oscillatory activity				
10	Event related desynchronization	Ray 2020 (N=40)		
Brain connectivity and Activation				
11	Resting state functional connectivity	Siegal JS 2016 (N=127)		
12	Ipsilesional corticocerebellar functional connectivity	Rosso 2013, Lu 2011, Mintzopoulos 2009 (N=61)		
13	Brain activation (extent and intensity)	Daly 2014, Faujii and Nakada 2003, Zemke 2003 (N=145)		Loubinoux 2007 (N=18)
14	Stimulus intensity	Bradnam 2012 (N=24)		
Location, size and volume				
15	Lesion size		Frias I 2018 (N=16)	
16	Stroke location	Zemke 2003 (N=35)		
17	Infarct volume		Cramer and Crafton 2006 (N=31)	
18	Lesion topography		Siegal JS 2016 (N=127)	
Cerebral blood flow				
19	Regional cerebral blood flow (rCBF)	Carey 2005		
Others				
20	Interhemispheric inhibition	Murase 2004 (N=17)		
21	Resting state functional connectivity	Dubovik 2013 (N=39)		
22	White matter integrity		Sullivan 2015 (N=51)	