Supplementary Materials

Determining corticospinal tract injury from stroke using computed tomography

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Supplementary Table S1: Individual data (summary of participant demographics)

| Participant	Age (years)	Sex (M/F)	Stroke-to-scan time (days)	Lesion location (L/R)	Spasticity present (Y/N)	Stroke-to-assessment time (days)	Time between scan and assessment (days)
1	85	F	0	R	Y	14	14
2	61	M	0	L	Y	39	39
3	76	M	0	R	N	78	78
4	43	F	0	L	N	89	89
5	59	M	0	R	Y	122	122
6	69	M	1	L	N	15	14
7	63	M	1	R	Y	30	29
8	62	M	1	R	N	38	37
9	58	F	1	R	N	43	42
10	50	M	1	R	Y	129	128
11	60	F	2	L	N	11	9
12	52	M	2	L	N	16	14
13	59	M	2	L	N	16	14
14	56	M	2	L	N	25	23
15	53	F	2	R	N	30	28
16	80	M	2	L	N	31	29
17	84	M	2	L	N	44	42
18	73	F	2	R	N	71	69
19	58	M	2	L	Y	99	97
20	86	F	2	L	Y	173	171
21	66	F	2	R	Y	245	243
22	83	M	2	L	N	255	253
23	44	M	2	L	N	372	370
24	63	F	3	L	N	14	11
25	67	F	3	R	N	32	29
26	68	M	3	L	Y	44	41
27	98	F	3	R	Y	53	50
28	70	M	3	R	Y	66	63
29	68	F	3	L	Y	186	183
30	77	M	4	R	Y	30	26
31	71	F	4	R	Y	40	36
32	54	M	4	L	N	54	50
33	65	M	5	L	Y	21	16
34	87	M	6	L	N	13	7
35	80	M	6	R	Y	139	133
36	59	M	7	L	N	32	25
37	68	F	7	R	N	32	25

Abbreviations: Sex (Male/Female); Lesion location (Left/Right); Spasticity present (Yes/No).

Supplementary Table S2: Individual data (summary of participant neurological measures and performance on motor assessments)

Participant	JHU-CST Injury (percent)	SMATT-CST Injury (percent)	JHU-wCST-LL (cc)	SMATT-wCST-LL (cc)	Lesion volume (cc)	CMSA-Arm (score)	CMSA-Hand (score)	CMSA-Motor (score)
1	0	0	0	0	8.26	6	6	12
2	80.36	100	2.90	2.73	11.56	2	3	5
3	0	0	0	0	1.72	7	6	13
4	81.82	100	2.72	2.54	12.74	3	5	8
5	69.44	76.92	2.46	3.42	68.33	2	2	4
6	50	42.86	0.60	0.40	2.49	3	4	7
7	100	100	2.85	3.86	160.71	2	1	3
8	96.61	100	1.74	1.74	59.74	1	1	2
9	17.20	62.50	0.14	0.21	0.68	1	2	3
10	100	100	4.82	5.07	108.63	3	2	5
11	56.89	80.77	1.27	1.41	3.80	1	1	2
12	0	100	1.26	1.60	2.20	5	3	8
13	39.62	66.67	1.12	0.91	2.17	5	5	10
14	38.89	36.36	0.28	0.33	87.82	5	5	10
15	68.31	0	0.21	0	81.80	6	6	12
16	0	0	0	0	2.25	2	2	4
17	2.78	96.15	3.00	2.27	22.40	4	4	8
18	100	100	3.93	3.86	117.90	1	1	2
19	11.11	3.33	0.006	0.005	9.50	5	3	8
20	7.58	0	0.02	0	1.59	4	4	8
21	32.08	33.33	0.21	0.26	7.62	4	5	9
22	0	0	0	0	6.32	6	6	12
23	39.66	42.10	0.40	0.55	81.12	7	7	14
24	78.79	100	2.08	2.23	6.28	5	5	10
25	100	100	1.32	3.42	151.38	5	6	11
26	69.69	77.42	1.50	1.68	78.32	1	1	2
27	100	100	3.35	3.46	48.99	7	6	13
28	100	100	3.26	3.49	206.60	2	2	4
29	87.93	100	1.40	1.25	5.71	2	2	4
30	19.79	100	0.32	0.50	1.37	5	5	10
31	100	100	2.19	4.81	158.16	2	3	5
32	43.94	61.54	0.69	0.54	1.32	4	4	8
33	0	10.53	0.23	0.14	2.77	4	4	8
34	0	0	0	0	18.87	7	5	12
35	75	100	2.29	2.46	93.53	2	2	4
36	20.59	0	0.03	0	1.34	2	1	3
37	45.28	100	1.38	1.39	2.79	3	5	8

Abbreviations: JHU-CST Injury (percent injury to the JHU corticospinal tract); SMATT-CST Injury (percent injury to the SMATT corticospinal tract); JHU-wCST-LL (weighted lesion load to the JHU corticospinal tract in cubic centimeters (cc)); SMATT-wCST-LL (weighted lesion load to the SMATT corticospinal tract in cubic centimeters (cc)); CMSA-Arm (Chedoke-McMaster Stroke Assessment Impairment Inventory: Stage of Arm Impairment, 1–7); CMSA-Hand (Chedoke-McMaster Stroke Assessment Impairment Inventory: Stage of Hand Impairment, 1–7); CMSA-Motor (composite measure of the CMSA-Arm and CMSA-Hand stages, 2–14).

Supplementary Figure S1
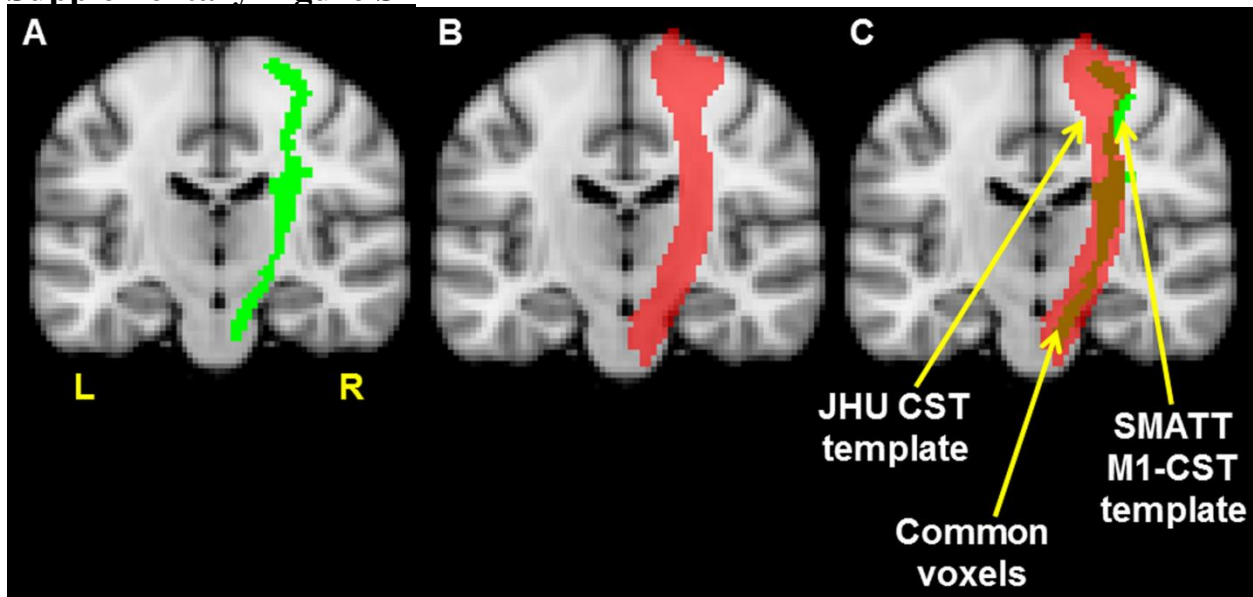
Supplementary Figure S1. Corticospinal tract (CST) template comparison. (**A**) CST template derived from the sensorimotor area tract template (SMATT M1-CST template) (green). (**B**) CST template derived from the Johns Hopkins University white-matter tractography atlas (JHU CST template) (red). (**C**) The SMATT M1-CST template (green) is overlaid on the JHU CST template (red) to display the common voxels (brown) between the two CST templates. The JHU CST template contains approximately six times more voxels than the SMATT M1-CST template ("L" represents left; "R" represents right)
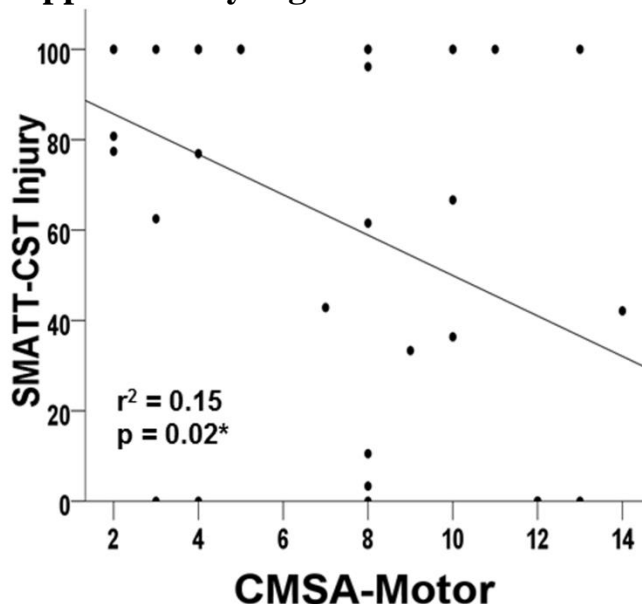
Secondary Analyses

Supplementary Table S3: Stepwise regression for CMSA-Motor using SMATT-CST Injury and demographic covariates as predictor variables

	R^2	Adjusted R^2	*p*-value	β	*p*-value
Step 1:	0.15	0.13	0.02*		
Variables included					
SMATT-CST Injury				–0.39	0.02^
Variables excluded					
Age				0.12	0.47
Sex				0.13	0.42
Lesion volume				–0.09	0.60
Presence/absence of spasticity				–0.14	0.36
Stroke-to-scan time				–0.02	0.91
CT scan to motor assessment time				0.15	0.35
Stroke hemisphere				0.04	0.78

R^2, adjusted R^2, beta (β), and associated *p*-values for the stepwise regression model to explain variability in Chedoke-McMaster Stroke Assessment Stage of Arm and Hand (CMSA-Motor) score. SMATT-CST Injury is the only variable that met statistical criteria (i.e., probability of F-statistic is $p < 0.05$) to enter the model. All demographic covariates did not meet the statistical criteria, and hence were excluded from the model. *Asterisk represents $p < 0.05$ for the final model. ^Caret represents $p < 0.05$ for the β-value of SMATT-CST Injury.

Supplementary Figure S2

Supplementary Figure S2. Scatterplot between CST Injury and CMSA-Motor score. The raw correlation is based on CST Injury calculations using the sensorimotor area tract template (SMATT) CST template. *Correlation significant at $p<0.05$.
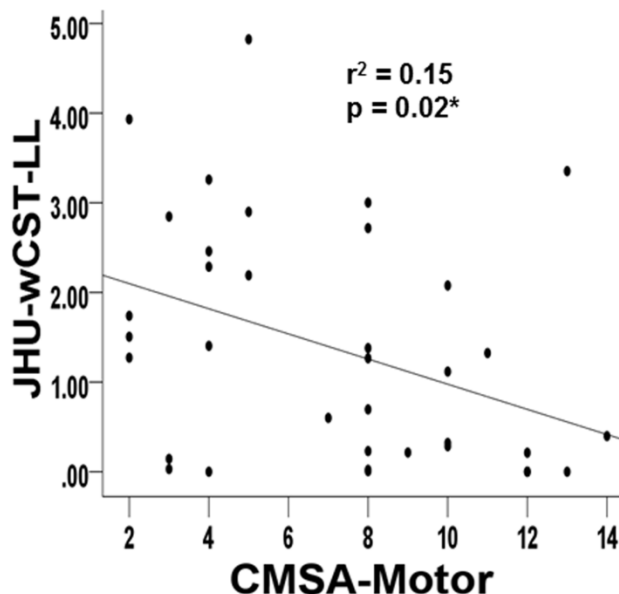
Secondary Analyses

Supplementary Table S4: Stepwise regression for CMSA-Motor using JHU-wCST-LL and demographic covariates as predictor variables

	R^2	Adjusted R^2	*p*-value	β	*p*-value
<u>Step 1</u>:	0.15	0.13	0.02*		
Variables included					
JHU-wCST-LL				–0.39	0.02^
Variables excluded					
Age				0.15	0.33
Sex				0.09	0.57
Lesion volume				–0.03	0.87
Presence/absence of spasticity				–0.10	0.52
Stroke-to-scan time				–0.08	0.63
CT scan to motor assessment time				0.18	0.26
Stroke hemisphere				0.03	0.85

R^2, adjusted R^2, beta (β), and associated *p*-values for the stepwise regression model to explain variability in Chedoke-McMaster Stroke Assessment Stage of Arm and Hand (CMSA-Motor) score. JHU-wCST-LL is the only variable that met statistical criteria (i.e., probability of F-statistic is $p < 0.05$) to enter the model. All demographic covariates did not meet the statistical criteria, and hence were excluded from the model. *Asterisk represents $p < 0.05$ for the final model. ^Caret represents $p < 0.05$ for the β-value of JHU-wCST-LL.

Supplementary Figure S3

Supplementary Figure S3. Scatterplot between weighted CST lesion load (wCST-LL) and CMSA-Motor score. The raw correlation is based on wCST-LL calculations using the Johns Hopkins University (JHU) white-matter tractography atlas as the CST template. *Correlation significant at *p*<0.05.

Secondary Analyses
<u>**Supplementary Table S5**</u>: **Stepwise regression for CMSA-Motor using SMATT-wCST-LL and demographic covariates as predictor variables**

	R^2	Adjusted R^2	*p*-value	β	*p*-value
<u>Step 1</u>:	0.14	0.11	0.02*		
Variables included					
SMATT-wCST-LL				–0.37	0.02^
Variables excluded					
Age				0.15	0.34
Sex				0.12	0.47
Lesion volume				0.06	0.80
Presence/absence of spasticity				–0.09	0.58
Stroke-to-scan time				–0.06	0.74
CT scan to motor assessment time				0.17	0.28
Stroke hemisphere				–0.004	0.98

R^2, adjusted R^2, beta (β), and associated *p*-values for the stepwise regression model to explain variability in Chedoke-McMaster Stroke Assessment Stage of Arm and Hand (CMSA-Motor) score. SMATT-wCST-LL is the only variable that met statistical criteria (i.e., probability of F-statistic is $p < 0.05$) to enter the model. All demographic covariates did not meet the statistical criteria, and hence were excluded from the model. *Asterisk represents $p < 0.05$ for the final model. ^Caret represents $p < 0.05$ for the β-value of SMATT-wCST-LL.

Supplementary Figure S4
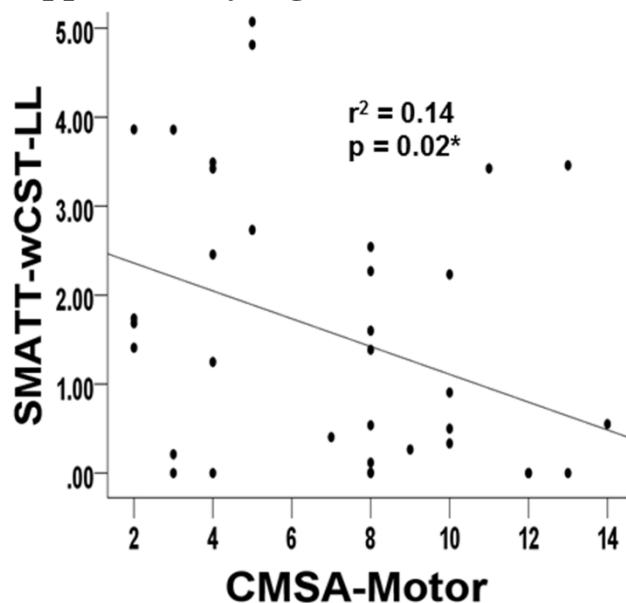
Supplementary Figure S4. Scatterplot between weighted CST lesion load (wCST-LL) and CMSA-Motor score. The raw correlation is based on wCST-LL calculations using the sensorimotor area tract template (SMATT) CST template. *Correlation significant at $p<0.05$.