

Supplementary Materials

Figure S1: Observed individual profiles for the (A) absolute and (B) normalized muscle morphology for (i) the total group of children with SCP (blue=GMFCS level I, dark red=level II and pink=level III), (ii) children with GMFCS level I, (iii) children with GMFCS level II and (iv) children with GMFCS level III. *SCP*, spastic cerebral palsy; *GMFCS*, gross motor function classification system; *MV*, muscle volume; *ml*, milliliter; *CSA*, anatomical cross-sectional area; *mm*, millimeter; *ML*, muscle belly length; *n*, normalized; *kg*, kilogram; *m*, meters.

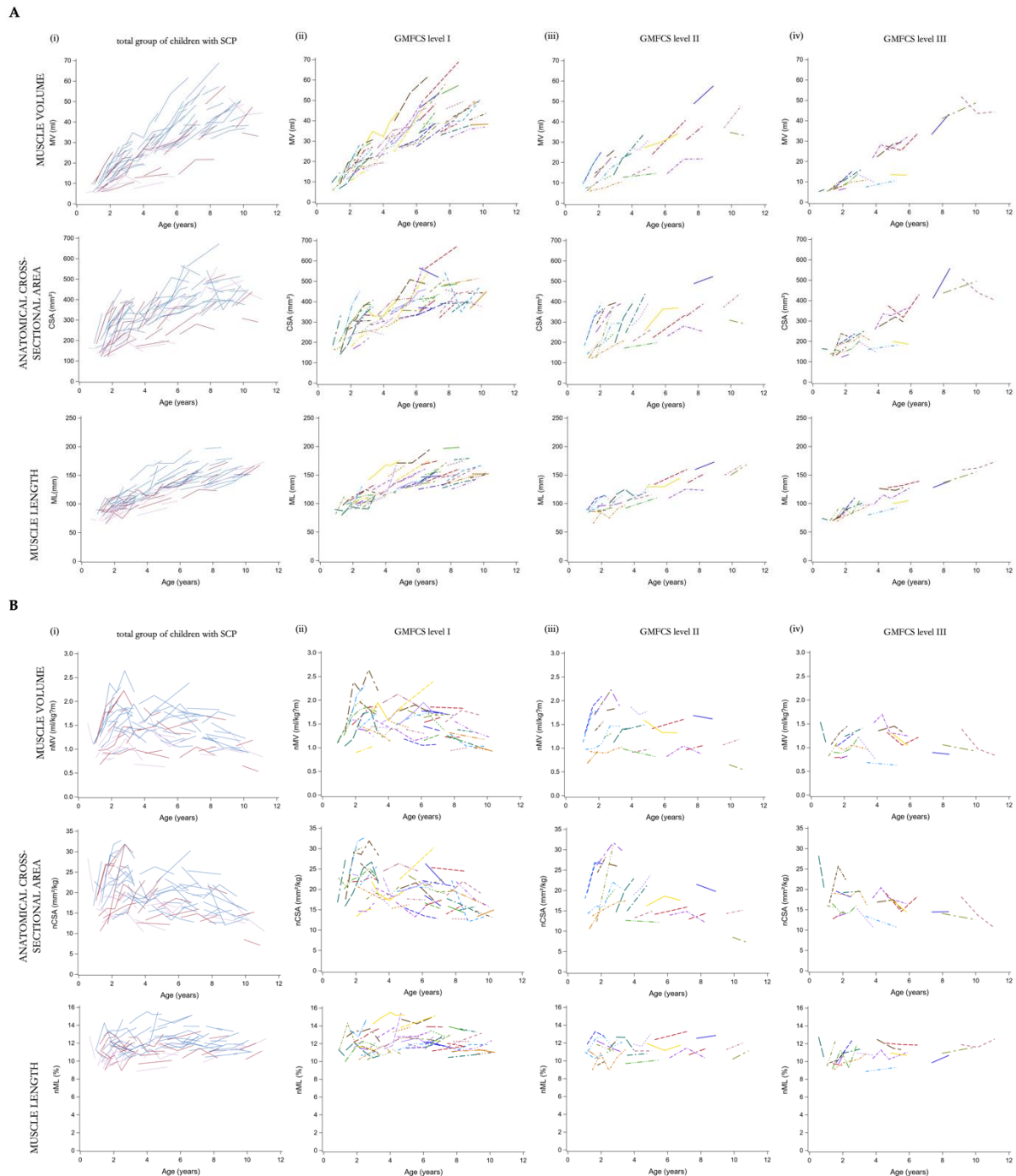
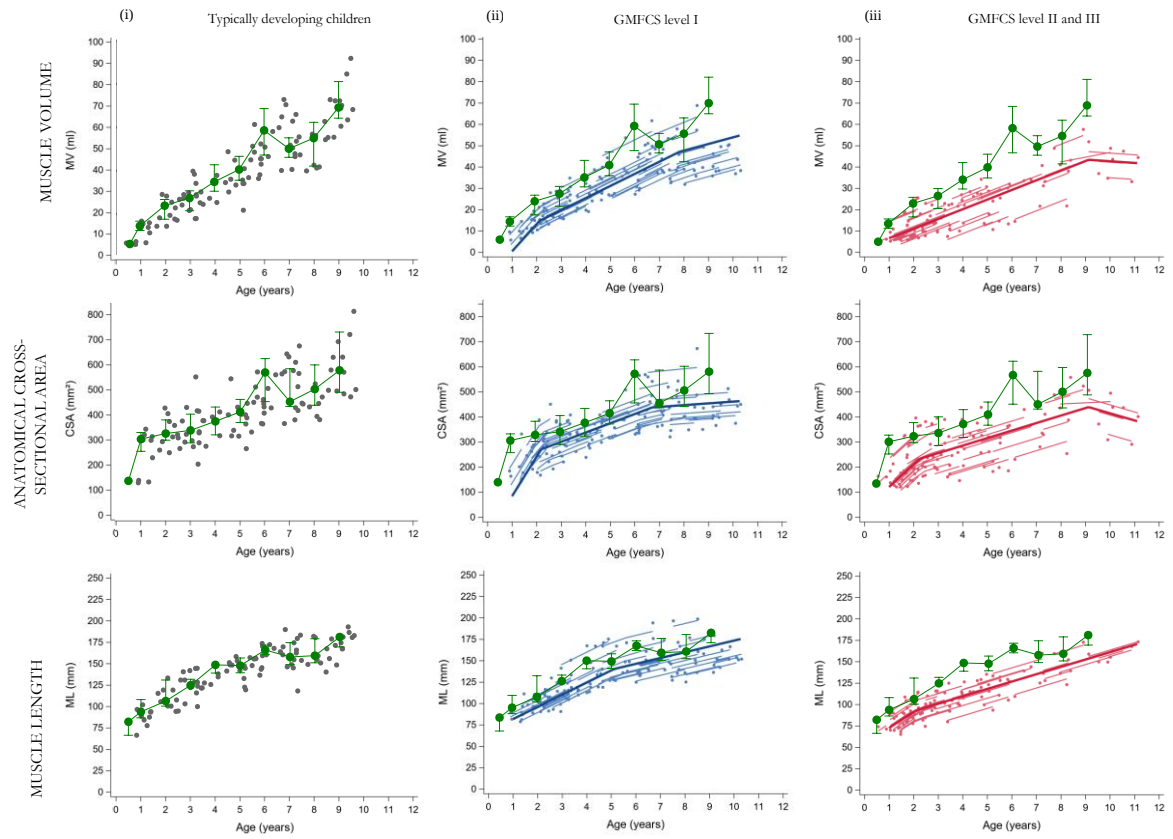


Figure S2

A: Reference dataset for absolute morphological muscle outcomes and **B:** Reference dataset for normalized morphological muscle outcomes (i) in addition to the predicted trajectories for the children with GMFCS levels I (ii) (blue) and GMFCS level II-III (iii) (red). For the TD children, the individual observed values (grey dots) and median with IQR per one year-age group (green boxplots) are presented. *TD*, typically developing children; *SCP*, spastic cerebral palsy; *GMFCS*, gross motor function classification system; *IQR*, interquartile range; *MV*, muscle volume; *ml*, milliliter; *CSA*, anatomical cross-sectional area; *mm*, millimeter; *ML*, muscle belly length; *n*, normalized; *kg*, kilogram; *m*, meters.

A



B

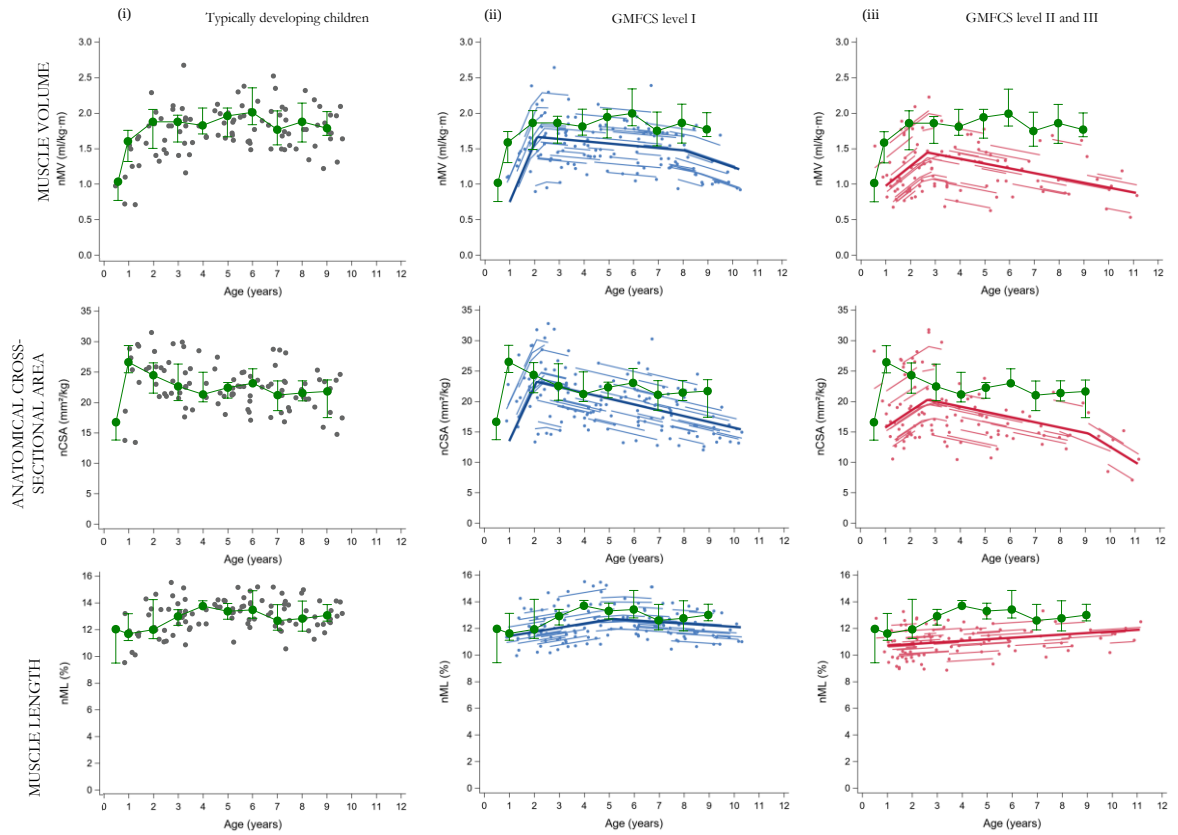


Table S1

Muscle morphology of retrospective cross-sectional dataset with TD children.

Outcome	Number of children	Median (IQ1-IQ3)
Age (y)	102	5.2 (3.0-7.3)
Body mass (kg)	102	18.7 (14.5-23.0)
Body length (cm)	102	110.3 (93.4-123.3)
MV (ml)	102	38.7 (24.7-123.3)
nMV (ml/kg·m)	102	1.8 (1.6-2.0)
CSA (mm ²)	100	409.3 (327.1-501.2)
nCSA (mm ² /kg)	100	22.6 (20.6-25.2)
ML (mm)	102	145.4 (121.9-161.2)
nML (%)	102	13.0 (12.0-13.8)

Anthropometric and muscle data are presented as median (interquartile 1- interquartile 3). *TD*, typical developing children; *IQ*, interquartile; *y*, years; *kg*, kilogram; *cm*, centimeter; *MV*, muscle volume; *ml*, milliliter; *n*, normalized; *CSA*, anatomical cross-sectional area; *ML*, muscle belly length; *kg*, kilogram; *m*, meters.

Table S2 Standard clinical care of all SCP participants.

	GMFCS level I group	GMFCS level II-III group
Participants (n)	47	40
Use of orthoses during the day	Frequently used, <i>n</i> = 25 Not frequently used, <i>n</i> = 12 Insoles, <i>n</i> = 2 Not used, <i>n</i> = 8	Frequently used, <i>n</i> = 22 Not frequently used, <i>n</i> = 11 Not used, <i>n</i> = 7
Use of orthoses during the night	Frequently used, <i>n</i> = 5 Not frequently used, <i>n</i> = 3 Not used, <i>n</i> = 39	Frequently used, <i>n</i> = 5 Not frequently used, <i>n</i> = 1 Not used, <i>n</i> = 34
Physiotherapy, min per week	75 (15 to 300)	120 (15 to 300)
Oral medication	Tone reduction, <i>n</i> = 3 Anti-epileptics, <i>n</i> = 3 Others, <i>n</i> = 6 Vitamin D-supplement, <i>n</i> = 7 Not used, <i>n</i> = 29	Tone reduction, <i>n</i> = 9 Anti-epileptics, <i>n</i> = 6 Others, <i>n</i> = 14 Vitamin D-supplement, <i>n</i> = 11 Not used, <i>n</i> = 12
BoNT-A treatment in the MG muscle during follow-up (n)	13	11
Serial casting during follow-up (n)	6	1

Frequently used indicated $\geq 50\%$ of the day or night whereas not frequently used indicated $<50\%$ of the day or night. The amount of physiotherapy is shown as median (minimum to maximum values). *GMFCS*, *Gross Motor Function Classification System*; *n*, *number of children*; *BoNT-A*, *botulinum neurotoxin type A*; *MG*, *medial gastrocnemius*.

Table S3

A Fixed and random effects of the piecewise regressions for muscle morphology (GMFCS I n=47 and GMFCS II-III n=40).

Outcome	Participants	Intercept	Breakpoints (c)		Variance random intercept	Variance residual
		α_0 (CI)	c_1 (CI)	c_2 (CI)	$\sigma^2 (=a_{1i})$ (CI)	$\sigma^2(=\varepsilon_{(1)ij})$ (CI)
		<i>p-value</i>	<i>p-value</i>	<i>p-value</i>	<i>p-value</i>	<i>p-value</i>
MV	GMFCS I	13.2 (10.6-15.7)	2.1 (1.8-2.5)	7.8 (6.6-9.0)		
		<0.0001	<0.0001	<0.0001	6.7 (5.4-7.9)	2.8 (2.5-3.2)
	GMFCS II-III	11.1 (9.7-12.5)	9.1 (9.1-9.1)		<0.0001	<0.0001
nMV	GMFCS I	1.57 (1.39-1.75)	2.1 (2.0-2.6)	8.0 (8.0-8.0)		
		<0.0001	<0.0001	<0.0001	0.3 (0.3-0.3)	0.1 (0.1-0.2)
	GMFCS II-III	1.25 (1.12-1.39)	2.7 (2.3-3.1)		<0.0001	<0.0001
CSA	GMFCS I	241.1 (209.2-273.0)	2.2 (2.0-2.4)	6.7 (5.6-7.8)		
		<0.0001	<0.0001	<0.0001	62.0 (50.6-73.3)	39.3 (32.6-46.0)
	GMFCS II-III	209.5 (172.7-246.2)	2.7 (1.5-3.0)	9.1 (8.0-10.3)	<0.0001	<0.0001
nCSA	GMFCS I	22.4 (20.3-24.4)	2.1 (2.1-2.1)	9.1 (7.7-10.6)		
		<0.0001	<0.0001	<0.0001	3.7 (3.0-4.4)	2.4 (2.0-2.9)
	GMFCS II-III	18.4 (16.4-20.4)	2.7 (2.0-3.5)		<0.0001	<0.0001
ML	GMFCS I	95.9 (92.2-99.6)	5.1 (4.5-5.8)			
		<0.0001	<0.0001		12.9 (10.1-15.7)	6.3 (5.1-7.5)
	GMFCS II-III	91.3 (86.2-96.4)	2.1 (1.6-2.6)		<0.0001	<0.0001
nML	GMFCS I	11.7 (11.3-12.2)	5.1 (4.0-6.2)			
		<0.0001	<0.0001		0.8 (0.7-1.1)	0.7 (0.6-0.8)
	GMFCS II-III	10.8 (10.5-11.2)			<0.0001	<0.0001

B Results of the differences between slopes and breakpoints (GMFCS, I n=47, and GMFCS II-III n=40).

Outcome	GMFCS I	Δ	<i>p-value</i>	GMFCS II-III	Δ	<i>p-value</i>
MV	$\beta_{1,I}$ vs. $\beta_{2,I}$	7.08	0.0021	$\beta_{1,I}$ vs. $\beta_{2,I}$	5.32	0.0255
	$\beta_{2,I}$ vs. $\beta_{3,I}$	2.57	0.0278			
	$\beta_{1,I}$ vs. $\beta_{3,I}$	9.65	0.0001			
nMV	$\beta_{1,I}$ vs. $\beta_{2,I}$	0.86	<0.0001	$\beta_{1,I}$ vs. $\beta_{2,I}$	0.35	<0.0001
	$\beta_{2,I}$ vs. $\beta_{3,I}$	0.09	0.0222			
	$\beta_{1,I}$ vs. $\beta_{3,I}$	0.95	<0.0001			
CSA	$\beta_{1,I}$ vs. $\beta_{2,I}$	121.4	<0.0001	$\beta_{1,I}$ vs. $\beta_{2,I}$	58.8	0.0050
	$\beta_{2,I}$ vs. $\beta_{3,I}$	30.0	0.0095	$\beta_{2,I}$ vs. $\beta_{3,I}$	58.1	0.0067
	$\beta_{1,I}$ vs. $\beta_{3,I}$	151.4	<0.0001	$\beta_{1,I}$ vs. $\beta_{3,I}$	116.9	0.0112
nCSA	$\beta_{1,I}$ vs. $\beta_{2,I}$	9.83	<0.0001	$\beta_{1,I}$ vs. $\beta_{2,I}$	3.57	0.0106
				$\beta_{2,I}$ vs. $\beta_{3,I}$	1.65	0.0424
				$\beta_{1,I}$ vs. $\beta_{3,I}$	5.21	0.0005
ML	$\beta_{1,I}$ vs. $\beta_{2,I}$	7.43	<0.0001	$\beta_{1,I}$ vs. $\beta_{2,I}$	10.3	0.0089
nML	$\beta_{1,I}$ vs. $\beta_{2,I}$	0.43	0.0117	NA		

P-values in bold indicate significance level at $p < 0.05$. The following symbols represent: α = response at the age of 2 years, CI= 95% confidence interval, c = age (years) of the breakpoint, $\sigma^2(a_{ii})$ = variance of random intercept and $\sigma^2(\varepsilon_{(1)ij})$ = variance of residual, β = change in outcome per year and Δ = difference score. GMFCS, gross motor function classification system; n, number; MV, muscle volume; n, normalized; CSA, anatomical cross-sectional area; ML, muscle belly length; NA, not applicable.

Figure S3

Observed individual trajectories for the (i) absolute and (ii) normalized muscle morphology for children with unilateral SCP (n=51) (grey) and children with bilateral SCP (n=36) (green); in GMFCS level I (light colors) and GMFCS level II-III (dark colors) group. *GMFCS*, gross motor function classification system; *SCP*, spastic cerebral palsy; *n*, number; *MV*, muscle volume; *ml*, milliliter; *CSA*, anatomical cross-sectional area; *mm*, millimeter; *ML*, muscle belly length; *n*, normalized.

