

TABLE E-1 Patient Demographics and Clinical Examination Parameters*

Subject	Age	M/F	Diag	GMFCS	AD	HT	WT	LD FE	RDF E	LPO P	RPO P	LKNEX T	RKNEX T	LHIPEX T	RHIPEX T	LTF A	RTF A	LTT	RTT
1	11	F	2	3	3	130	55	15°	15°	-60°	-55°	-5°	-10°	-10°	-10°	-10°	-30°	15°	15°
2	12	F	2	3	3	142	60	15°	15°	-60°	-60°	-5°	-10°	-5°	-5°	0°	-15°	25°	25°
3	16	M	2	3	1	168	50	5°	5°	-50°	-50°	-15°	-5°	-10°	-10°	5°	5°	25°	20°
4	10	M	2	2	0	135	26	15°	15°	-35°	-35°	-10°	-15°	-10°	-10°	10°	20°	40°	25°
5	13	M	2	2	0	151	60.2	5°	5°	-55°	-55°	-5°	-10°	0°	0°	10°	30°	10°	50°
6	15	M	4	3	2	147	44	15°	15°	-35°	-45°	-10°	-10°	-5°	-5°	10°	20°	40°	50°
7	14	M	2	3	3	156	50	0°	-5°	-60°	-65°	-35°	-30°	-20°	-25°	15°	5°	40°	35°
8	13	M	2	2	0	164	55	5°	15°	-45°	-40°	-15°	-10°	-15°	-5°	0°	30°	30°	50°
9	12	M	2	3	3	146	39	-5°	5°	-45°	-40°	-20°	-20°	-15°	-10°	30°	20°	50°	35°
10	13	M	2	2	0	152	35	10°	10°	-25°	-15°	-5°	-5°	-10°	-10°	5°	5°	30°	30°
11	9	F	2	2	0	122	21	5°	10°	-55°	-70°	-5°	-10°	-10°	-15°	0°	10°	25°	30°
12	11	M	4	2	0	143	33.1	25°	20°	-50°	-60°	0°	-5°	-5°	-10°	0°	5°	40°	50°
13	12	M	2	3	2	162	57.3	-5°	0°	-50°	-60°	-25°	-25°	-20°	-20°	5°	10°	30°	30°
14	12	M	2	2	0	139	29.5	10°	0°	-40°	-35°	0°	0°	0°	0°	5°	10°	10°	20°
15	9	F	2	2	0	130	44	15°	10°	-50°	-50°	-5°	-10°	-5°	-5°	-5°	0°	10°	30°
16	11	F	2	2	0	138	33	0°	-5°	-40°	-45°	0°	-5°	-5°	-5°	10°	10°	50°	45°
17	7	M	2	2	0	132	35	-15°	-15°	-55°	-50°	-20°	-20°	-15°	-15°	10°	15°	15°	20°
18	8	M	2	2	0	146	55.5	15°	20°	-35°	-40°	5°	0°	0°	0°	30°	30°	40°	40°
19	14	M	2	3	2	149	23.8	15°	20°	-55°	-50°	-5°	0°	0°	0°	30°	20°	30°	50°
20	13	F	2	3	1	146	43.9	10°	10°	-55°	-50°	0°	-5°	-5°	-5°	10°	20°	30°	40°
21	12	M	2	2	0	152	48	5°	5°	-30°	-20°	-15°	-10°	-10°	-10°	15°	25°	35°	40°
22	14	M	3	2	0	163	53	10°	0°	-65°	-50°	-15°	-20°	-10°	-15°	25°	20°	30°	30°
23	16	F	2	3	3	150	48	0°	5°	-40°	-40°	-5°	-5°	-10°	-10°	0°	5°	5°	10°
24	13	M	2	3	3	135	35	10°	15°	-30°	-45°	-15°	-20°	-20°	-25°	20°	30°	25°	40°
25	15	M	2	3	3	150	36	5°	15°	-30°	-30°	-10°	-10°	-5°	-5°	10°	5°	30°	35°
26	15	M	2	2	0	157	42	10°	10°	-30°	-20°	-5°	-5°	-5°	-10°	15°	0°	40°	30°
27	15	F	2	3	2	145	50	15°	15°	-30°	-30°	0°	0°	0°	0°	10°	10°	20°	20°
Mean	12.4					146	43	8°	9°	-45°	-45°	-9°	-10°	-8°	-9°	10°	12°	29°	33°
STD(±)	2.4					11	11	8	9	12	14	9	8	6	7	10	14	12	12

*Diag = physical geographic classification of cerebral palsy (2 = diplegia and 4 = quadriplegia), GMFCS = Gross Motor Function Classification System, AD = assistive device (0 = none, 1 = single Loftstrand crutch, 2 = bilateral Loftstrand crutches, and 3 = posterior rolling walker), HT = height in centimeters, WT = weight in kilograms, LD FE = left ankle dorsiflexion with knee extended, RDF E = right ankle dorsiflexion with knee extended, LPO P = left popliteal angle, RPO P = right popliteal angle, LKNEX T = left knee extension, RKNEX T = right knee extension, LHIPEX T = left hip extension, RHIPEX T = right hip extension, LTF A = left thigh-foot angle (negative [-] = internal), RTF A = right thigh-foot angle (negative [-] = internal), LTT = left tibial torsion (negative [-] = internal), RTT = right tibial torsion (negative [-] = internal), and STD = standard deviation.

TABLE E-2 Surgical History*

Subject	Date of Study	Surgical History
1	5/18/2006	1/97-SDR; 7/01-(B) VDRO; (R) GSR / MHL / LHL / Dega Osteotomy
2	7/6/2007	1/97-SDR; 7/01-(B) VDRO; (R) GSR / MHL / LHL / Dega Osteotomy
3	4/19/2006	7/96-(B) IPR / MHL / RFT / GSR; 9/03-(B) MHL / LHL
4	8/17/2005	5/00-(B) TAL / MHL / Gracilis tenotomy / (L) TRO
5	7/31/2007	12/97-(B) TAL / Botox to (B) ADD and HS; 12/99-Botox to (B) ADD and HS; 12/01-(B) ADD tenotomies / (B) MHL / RFT / LCL / (R) SSC knee joint
6	7/14/2006	2/98-(B) VDRO / Perc MHL / GSR; 6/93-(B) ADD releases / (B) TAL; 11/04-(B) TRO / MHL
7	9/26/2002	1/93-(B) FRO / MHL; 1/94-(B) HWR of Femur, (B) Perc MHL / Perc ADD release
8	5/13/2003	1/93-SDR; 5/97 (B) STA / GSR; 1/02-(L) FRO, (B) MHL / RFT
9	4/14/2003	10/94-(B) MHR / ADD release / TAL; 10/02-(B) MHL / LCL / SSC knees / (L) TRO
10	4/5/2004	11/98-(B) MHL / RFT
11	2/19/2003	None
12	10/24/2003	1/98-(B) TAL / Perc ADD releases; 11/01-Baclofen pump; 10/02-(B) MHL / GSR / LCL
13	10/31/2002	2/01-(R) FRO / TRO / 1st MTP fusion / (B) MHL / LHL; 4/02-(R) HWR Femur / (R) HWR Tibia / Botox to (B) HS
14	6/2/2003	6/95-SDR
15	6/10/2003	1/00-(R) TAL / LCL / (L) GSR / Botox to (B) HS
16	3/26/2004	11/97-SDR; 1/01-Botox (B) GS
17	11/4/2004	8/02-Botox (B) GS
18	10/31/2006	2/05-(B) MHL / TAL / LCL
19	9/22/2006	9/03-(B) MHL / (R) FRO
20	4/23/2007	11/99-(B) MHL / RFT / TAL / ADD release; 8/05-(B) MHL / (R) GSR / LCL / Medial Cuneiform Osteotomy
21	12/12/2005	7/95-(B) MHL; 9/97-(L) TRO; 4/99-(B) ADD tenotomy / IPR / MHL / TAL; 12/04-(B) MHL / SSC knee joint
22	6/15/2006	6/99-(R) TAL; 2/04-(R) FRO / TRO / (B) MHL / RFT / SSC knee joint
23	3/29/2006	4/95-(B) IPR / MHL / RFT / TAL
24	12/22/2004	1/94-(B) VDRO / Perc MHR; 1/95-(B) HWR Femur / Perc ADD release; 1/98-(L) Dega osteotomy / FRO / (B) GSR / Botox to HS / SSC knee joint
25	7/5/2006	1/94-(B) VDRO / Perc MHR; 1/95-(B) HWR Femur / Perc ADD release; 1/98-(L) Dega osteotomy / FRO / (B) GSR / Botox to HS / SSC knee joint; 1/05-(B) MHL / LHL / SSC knee joint / (R) TRO
26	7/5/2006	1/94-(B) FRO / Perc ADD release / MHR / TAL; 1/95-(B) HWR Femur; 2/02-Botox to (B) HS and GS; 7/05-(B) MHL / RFT / TRO / (L) LHL / LCL
27	12/19/2006	6/92-(L) Hip Reduction / ADD release; 11/96-(B) IPR / ADD release / GSR; 5/01-(B) MHL / TRO / (L) LHL / (B) SSC knee joint; 12/05-(B) DFEO / MTP fusion / (L) LCL

*(L) = left, (R) = right, (B) = bilateral, SDR = selective dorsal rhizotomy, VDRO = varus derotational osteotomy, GSR = gastrocnemius-soleus recession, MHL = medial hamstring lengthening, LHL = lateral hamstring lengthening, IPR = iliopsoas recession, TAL = tendoachilles lengthening, TRO = tibial rotation osteotomy, FRO = femoral rotation osteotomy, LCL = lateral column lengthening (calcaneal osteotomy), ADD = adductors, HS = hamstrings, SSC = serial stretch casting, Perc = percutaneous, HWR = hardware removal, STA = subtalar arthrodesis, MHR = medial hamstring release, MTP = metatarsal phalange, GS = gastrocnemius-soleus, RFT = rectus femoris transfer, and DFEO = distal femoral extension osteotomy.

TABLE E-3A Barefoot Kinematic and Kinetic Data*

Subject	Side	Speed	Stride	CAD	MFPA	MFPA STD	PADF	ADROM	PKE	MSKM
Norm		1.29 ($\pm$ 0.15)	1.12 ($\pm$ 0.17)	69.62 ($\pm$ 8.4)	-6	$\pm$ 6	10 ($\pm$ 4)	30 ($\pm$ 7)	0 ($\pm$ 5)	-0.32 ($\pm$ 0.11)
1	R	1.03	1.08	58	9	$\pm$ 4	23	31	46	
1	L	1.05	1.14	55	3	$\pm$ 5	31	47	50	
2	R	0.74	1.15	39	2	$\pm$ 8	32	57	49	
2	L	0.82	1.2	41	7	$\pm$ 3	29	43	54	
3	L	0.77	0.91	50	-9	$\pm$ 4	23	10	28	
3	R	0.7	0.86	49	-16	$\pm$ 5	22	20	12	
4	R	0.98	0.87	68	-13	$\pm$ 7	38	22	47	
4	L	1	0.86	69	15	$\pm$ 4	33	21	47	
5	R	0.55	0.67	50	-6	$\pm$ 3	32	19	24	
5	L	0.57	0.64	53	20	$\pm$ 6	29	19	13	
6	L	0.23	0.53	26	-11	$\pm$ 16	38	20	30	
6	R	0.26	0.61	25	-9	$\pm$ 8	38	11	29	
7	R	0.49	0.78	38	-25	$\pm$ 3	32	20	49	
7	L	0.5	0.72	42	-26	$\pm$ 6	24	15	53	
8	L	0.96	1.1	52	-8	$\pm$ 2	28	24	42	0.68
8	R	0.93	1.04	54	-9	$\pm$ 3	27	24	27	0.08
9	R	0.56	0.81	42	-29	$\pm$ 10	25	40	22	
9	L	0.67	0.97	42	-35	$\pm$ 16	10	35	33	
10	L	1.02	1.02	60	0	$\pm$ 3	27	25	11	-0.28
10	R	0.93	0.93	59	13	$\pm$ 3	32	26	10	0.03
11	R	0.63	0.63	59	-17	$\pm$ 4	23	11	34	
11	L	0.64	0.65	59	2	$\pm$ 4	6	11	28	
12	L	0.52	0.54	57	-1	$\pm$ 3	19	24	9	
12	R	0.7	0.67	63	-38	$\pm$ 2	34	26	24	
13	R	0.61	0.94	39	-6	$\pm$ 3	12	8	41	
13	L	0.65	0.97	40	0	$\pm$ 5	18	14	29	
14	L	1.19	1.07	67	-2	$\pm$ 5	21	18	21	-0.17
14	R	1.14	1.13	61	-7	$\pm$ 2	16	15	17	-0.20
15	R	1.17	0.81	87	-1	$\pm$ 4	32	29	29	0.13
15	L	0.92	0.77	72	-19	$\pm$ 2	29	30	29	0.10
16	L	0.88	0.88	60	-30	$\pm$ 2	24	11	17	0.15
16	R	0.88	0.8	66	-20	$\pm$ 3	21	13	2	0.06
17	L	0.71	0.79	54	-34	$\pm$ 8	22	12	42	0.26
17	R	0.77	0.88	53	-28	$\pm$ 5	26	19	37	0.14
18	L	0.42	0.46	55	-37	$\pm$ 1	18	20	14	

18	R	0.49	0.52	57	-32	± 1	21	15	9	
19	R	0.82	1.23	40	-26	± 5	27	31	0	
19	L	0.78	1.17	40	-27	± 7	21	24	5	
20	R	0.5	0.7	43	1	± 3	26	22	16	
20	L	0.52	0.72	43	-5	± 2	29	32	9	
21	L	0.47	0.62	46	19	± 3	38	27	31	
21	R	0.48	0.62	46	-12	± 7	37	20	34	
22	R	1.06	0.96	67	-44	± 6	23	20	44	0.52
22	L	1.1	0.97	68	-30	± 5	34	29	43	0.87
23	L	0.64	0.85	45	6	± 4	15	18	8	
23	R	0.71	0.85	50	2	± 2	21	22	13	
24	R	0.57	0.77	45	-35	± 10	39	22	43	
24	L	0.48	0.7	41	-19	± 17	38	19	47	
25	R	0.73	0.91	48	-4	± 4	22	12	19	
25	L	0.72	0.86	50	-6	± 4	30	12	27	
26	L	0.83	0.9	55	-33	± 1	29	26	31	0.50
26	R	0.89	0.98	55	8	± 3	27	25	25	0.06
27	L	0.25	0.64	23	-7	± 3	44	26	42	
27	R	0.24	0.61	24	-2	± 3	43	23	42	

*Norm = established laboratory reference norms, L = left, R = right, Speed = gait velocity in meters per second, Stride = stride length in meters, CAD = cadence in steps per minute, MFPA = mean foot progression angle in stance in degrees (negative [-] = external progression), MFPA STD = standard deviation of the mean foot progression angle in stance in degrees, PADF = peak ankle dorsiflexion in stance in degrees, ADROM = ankle dynamic range of motion in stance in degrees, PKE = peak knee extension in stance in degrees, and MSKM = mean sagittal knee moment in stance in newton-meters per kilogram (negative [-] = flexor moment).

TABLE E-3B Floor-Reaction Ankle-Foot Orthosis Kinematic and Kinetic Data*

Subject	Side	Speed	Stride	CAD	MFPA	MFPA STD	PADF	ADROM	PKE	MSKM
Norm		1.29 (± 0.15)	1.12 (± 0.17)	69.62 (± 8.4)	-6	± 6	10 (± 4)	30 (± 7)	0 (± 5)	-0.32 (± 0.11)
1	R	0.83	0.95	52	-2	± 1	6	10	13	
1	L	0.86	0.96	54	-5	± 2	12	13	5	
2	L	0.79	1.29	37	20	± 3	-1	6	36	
2	R	0.75	1.11	40	4	± 2	9	8	15	
3	L	0.75	0.99	45	-18	± 3	11	6	20	
3	R	0.72	0.95	45	-14	± 4	7	4	9	
4	R	0.9	0.95	57	-15	± 5	19	14	45	
4	L	0.91	0.94	58	26	± 3	18	18	39	
5	R	0.48	0.64	45	-21	± 5	14	9	23	
5	L	0.46	0.65	42	3	± 7	15	12	11	
6	L	0.7	0.92	45	-6	± 2	13	4	16	
6	R	0.94	1.18	48	-16	± 3	18	10	12	
7	R	0.53	0.81	39	-9	± 1	11	6	46	
7	L	0.5	0.78	38	-20	± 7	7	6	53	
8	L	0.91	1.03	52	3	± 2	12	12	27	0.17
8	R	1.02	1.2	51	-18	± 2	10	11	10	-0.25
9	R	0.76	1.06	43	-18	± 4	22	15	17	
9	L	0.77	1.01	46	-38	± 12	8	9	33	
10	L	1.19	1.21	59	12	± 5	8	15	1	-0.26
10	R	1.07	1.2	53	11	± 6	-1	9	4	-0.21
11	R	0.71	0.65	65	-24	± 2	19	8	27	
11	L	0.73	0.64	69	7	± 1	16	9	24	
12	R	0.74	0.77	58	-26	± 4	9	7	7	
12	L	0.8	0.83	58	13	± 6	4	6	4	
13	L	0.61	0.95	38	-3	± 3	20	14	28	
13	R	0.67	1.09	37	-5	± 2	2	4	38	
14	L	1.17	1.03	68	1	± 3	5	5	1	-0.60
14	R	1.14	0.97	71	-10	± 1	4	5	8	-0.46
15	R	0.82	0.77	64	3	± 1	13	13	20	0.04
15	L	0.89	0.9	59	-24	± 3	6	11	15	-0.08
16	L	1.18	1.14	62	-15	± 4	3	12	6	-0.11
16	R	1.11	1.13	59	-14	± 3	-4	7	-21	-0.54
17	L	0.89	1.02	52	-39	± 2	12	5	39	0.11
17	R	0.94	1.11	51	-19	± 2	10	6	25	-0.27
18	L	0.97	1.15	50	-22	± 4	13	17	5	
18	R	0.94	1.08	52	-18	± 3	14	17	-7	
19	L	0.97	1.36	43	-28	± 2	6	5	0	
19	R	0.87	1.24	42	-29	± 3	6	6	-1	
20	R	0.64	0.91	42	12	± 3	14	7	23	
20	L	0.68	0.91	44	0	± 3	11	9	15	
21	L	0.8	1.13	42	7	± 3	16	11	12	-0.16
21	R	0.92	1.2	46	-26	± 4	14	14	11	-0.18
22	R	1.03	1.05	59	-24	± 4	7	9	38	0.46
22	L	0.98	1.03	57	-22	± 7	18	12	37	0.53

23	L	0.85	1.01	51	5	± 3	11	13	7	
23	R	0.84	0.99	51	-3	± 3	5	9	7	
24	R	0.81	1.11	44	-54	± 6	17	10	42	
24	L	0.71	0.99	43	-25	± 10	22	14	42	
25	L	0.85	1.07	48	4	± 3	23	16	14	
25	R	0.78	1.08	44	1	± 4	8	5	10	
26	R	1.05	1.25	51	-9	± 3	11	11	18	-0.05
26	L	0.97	1.18	49	-14	± 1	13	19	27	0.29
27	R	0.44	0.71	37	-12	± 7	10	10	23	
27	L	0.44	0.76	35	-20	± 3	12	7	14	

*Norm = established laboratory reference norms, L = left, R = right, Speed = gait velocity in meters per second, Stride = stride length in meters, CAD = cadence in steps per minute, MFPA = mean foot progression angle in stance in degrees (negative [-] = external progression), MFPA STD = standard deviation of the mean foot progression angle in stance in degrees, PADF = peak ankle dorsiflexion in stance in degrees, ADROM = ankle dynamic range of motion in stance in degrees, PKE = peak knee extension in stance in degrees, and MSKM = mean sagittal knee moment in stance in newton-meters per kilogram (negative [-] = flexor moment).