

Appendix A: Relation gait feature - possible impairments

Developed at Amsterdam UMC, Department of Rehabilitation Medicine, as part of the GAIT.SCRIPT project*

Plane	Segment/joint	Gait Feature	Gait phase	Underlying impairment	Likelihood	
					Mean	(SD)
S	Trunk	Forward lean increased	Stance	<< Knee extension increased	3,5	0,7
S	Trunk	Hyper lordose	Stance	<< Anterior tilt increased	4,4	0,5
			Stance	<< Knee extension increased	3,4	0,8
F	Trunk	Ipsilateral lean	EST-LST	Gluteus medius weakness	4,1	0,6
S	Pelvis	Anterior tilt increased	Stance	Gluteus maximus weakness	3,2	0,7
			Stance	Hamstrings weakness	3,4	0,9
			Stance	Iliopsoas spasticity / contracture	3,9	0,6
			Stance	<< Knee hyperextension	2,9	1,0
			Swing	Iliopsoas spasticity / contracture	3,6	1,0
S	Pelvis	Posterior tilt movement increased	LSW	Hamstrings spasticity / contracture	4,3	0,6
F	Pelvis	Obliquity drop	Gait cycle	Anatomical leg length discrepancy - shortest leg	3,0	1,0
F	Pelvis	Obliquity lift	Gait cycle	Adductor spasticity / contracture	2,6	0,6
			Gait cycle	Anatomical leg length discrepancy - longest leg	2,9	1,0
			Stance	Gluteus medius weakness	3,6	1,0
			Swing	<< Clearance decreased	3,2	1,1
T	Pelvis	Protraction increased	Stance	<< Contralateral retraction increased	3,8	0,7
T	Pelvis	Retraction increased	LST-PSW	Femoral anteversion increased	3,1	0,8
			LST-PSW	Iliopsoas spasticity / contracture	3,6	0,6
			LST-PSW	<< Hip extension decreased	3,9	0,7
S	Hip	Extension decreased	LST-PSW	Rectus femoris spasticity	2,6	1,0
			LST-PSW	Iliopsoas spasticity / contracture	3,8	0,6
			LST-PSW	Gluteus maximus weakness	2,7	1,3
S	Hip	Peak extension delayed	Stance	Gastrocnemius weakness	2,7	1,2
			Stance	Soleus weakness	2,8	1,3
			Stance	Gluteus maximus weakness	2,6	0,9
S	Hip	Flexion delayed	ESW	Limited selective control (flexion/extension synergy)	2,9	1,0
S	Hip	Flexion increased	Stance	Gluteus maximus weakness	3,1	1,0
			Stance	<< Knee flexion increased in stance	4,4	0,5
S	Hip	Flexion increased (high steps)	Swing	Limited selective control (flexion/extension synergy)	2,8	1,1
			Swing	<< Contralateral stance leg (functionally) shorter	2,9	1,0
S	Hip	Flexion decreased	Swing	Iliopsoas weakness	2,9	0,9
			Swing	<< Push-off decreased	3,9	0,9
F	Hip	Adduction increased	Gait cycle	Adductor spasticity / contracture	3,7	1,0
			Stance	Gluteus medius weakness	3,8	0,8
F	Hip	Abduction (circumduction)	Swing	<< Clearance decreased	3,8	0,9
			Swing	<< Contralateral stance leg (functionally) shorter	2,9	1,0
T	Hip	Exorotation increased	Gait cycle	Tibial torsion too internal	2,1	0,9
T	Hip	Endorotation increased	Gait cycle	Adductor spasticity / contracture	3,1	0,8
			Stance	Femoral anteversion increased	4,1	0,7
			Stance	Gluteus maximus weakness	2,9	0,8
			Stance	Tibial torsion too external	3,1	1,0
			LSW	Hamstrings spasticity / contracture	4,2	0,8
T	Hip	Adduction increased	LSW	Hamstrings spasticity / contracture	4,2	0,8
S	Knee	Extension decreased	LSW	<< Push-off decreased	3,5	0,9
			LSW	Gastrocnemius spasticity / contracture	3,3	1,0
			LSW	Hamstrings spasticity / contracture	4,1	0,7
			LSW	Limited selective control (flexion/extension synergy)	3,6	0,8
S	Knee	Extension movement	LR	Soleus spasticity / contracture	4,1	0,9
S	Knee	Flexion decreased	Swing	<< Reduced walking speed	3,4	0,7
			PSW-ESW	Iliopsoas weakness	2,6	1,1
			ESW	<< Knee flexion increased in LST-PSW	2,7	1,0
			ESW	Rectus femoris spasticity	3,6	0,6
			ESW	<< Push-off decreased	4,4	0,8
S	Knee	Flexion delayed	ESW	Limited selective control (flexion/extension synergy)	3,4	0,9
S	Knee	Flexion increased	Stance	Knee flexion contracture	4,1	1,0
			Stance	Excessive ankle plantar flexor length	3,4	1,0
			Stance	Foot deformity	3,6	0,7
			Stance	Gastrocnemius spasticity / contracture	3,6	1,3
			Stance	Gluteus maximus weakness	2,6	0,9

Appendix A: Relation gait feature - possible impairments

Plane	Segment/joint	Gait Feature	Gait phase **	Underlying impairment	Likelihood	
					Mean	(SD)
S	Knee	Flexion increased (continued)	Stance	Iliopsoas spasticity / contracture	3,2	0,9
			Stance	Limited selective control (flexion/extension synergy)	3,2	1,0
			Stance	Anatomical leg length discrepancy - longest leg	2,9	1,0
			EST-LST	Hamstrings spasticity / contracture	2,9	1,0
			EST	Gastrocnemius weakness	3,8	1,1
			LST	Gastrocnemius weakness	4,2	0,9
			LR-EST	Extension lag	3,1	1,0
			EST	Soleus weakness	4,0	1,0
S	Knee	Flexion increased (high steps)	Swing	<< Contralateral stance leg (functionally) shorter	2,6	0,9
S	Knee	Extension increased	Stance	Quadriceps weakness	3,2	1,3
			EST-LST	Soleus spasticity / contracture	4,2	0,9
S	Tibia	Forward inclination increased (v)	EST-LST	Soleus weakness	4,3	0,8
			EST-LST	Gastrocnemius weakness	3,9	0,7
S	Ankle	Dorsal flexion increased	LR-LST	Excessive ankle plantar flexor length	3,5	1,0
			Stance	Knee flexion contracture	3,3	1,0
			LR-LST	Soleus weakness	4,5	0,6
			LST	Gastrocnemius weakness	4,2	0,6
S	Ankle	Plantar flexion decreased	PSW	Gastrocnemius weakness	4,4	0,6
			PSW	Soleus weakness	4,0	0,9
S	Ankle	Plantar flexion increased	LSW	Gastrocnemius spasticity / contracture	4,1	0,9
			LR-LST	Gastrocnemius spasticity / contracture	4,4	0,7
			LSW	Limited selective control (flexion/extension synergy)	3,7	0,9
			MST	Limited selective control (flexion/extension synergy)	2,9	0,8
			LSW	Soleus spasticity / contracture	3,1	1,0
			LR-LST	Soleus spasticity / contracture	4,1	0,7
			Swing	Tibialis anterior weakness	3,9	1,0
			LSW	Tibialis anterior weakness	3,9	1,0
S	Ankle	Plantar flexion increased (vaulting)	Stance	Anatomical leg length discrepancy - shortest leg	3,4	0,9
S	Ankle	Plantar flexion peak too early	EST-LST	Gastrocnemius spasticity / contracture	4,6	0,6
			EST-LST	Soleus spasticity / contracture	4,3	0,8
T	Ankle	Internal rotation increased	Gait cycle	Tibialis posterior spasticity / contracture	3,3	1,1
			Gait cycle	Gastrocnemius spasticity / contracture	3,2	0,4
			Gait cycle	Peroneus weakness	3,2	0,8
F	Ankle	Inversion (varus) increased	Gait cycle	Tibialis posterior spasticity / contracture	3,9	0,7
			Gait cycle	Gastrocnemius spasticity / contracture	3,2	0,4
			Gait cycle	Peroneus weakness	3,2	0,8
F	Ankle	Eversion (valgus) increased	Gait cycle	Peroneus spasticity / contracture	2,2	0,9
			Gait cycle	Tibialis posterior weakness	3,3	0,6
S	Foot	Early heelrise (v)	EST	Gastrocnemius spasticity / contracture	4,5	0,6
			EST	Soleus spasticity / contracture	4,2	0,8
S	Foot	Toe walking (v)	Stance	Gastrocnemius spasticity / contracture	4,5	0,6
			Stance	Soleus spasticity / contracture	4,2	0,8
S	Foot	Forefoot/ midfoot contact (v)	IC	Tibialis anterior weakness	4,1	0,9
			IC	Limited selective control (flexion/extension synergy)	3,5	0,8
			IC	Gastrocnemius spasticity / contracture	4,2	0,9
			IC	Soleus spasticity / contracture	3,9	1,0
S	Foot	Clearance decreased (v)	ESW	<< Ankle plantar flexion increased in ESW	3,9	1,2
			ESW	<< Knee flexion decreased in ESW	4,3	0,6
F	Foot	Lateral foot contact (v)	IC	Foot deformity	4,0	1,0
			IC	Gastrocnemius spasticity / contracture	2,6	0,9
			IC	Peroneus weakness	3,3	0,7
			IC	Tibialis posterior spasticity / contracture	4,5	0,5
F	Foot	Narrow stride width	Stance	Hamstrings spasticity / contracture	3,4	0,7
T	Foot	Progression angle too external	Stance	Foot deformity	4,0	0,7
			Stance	Tibial torsion too external	4,0	0,7
T	Foot	Progression angle too internal	Stance	Foot deformity	3,7	0,6
			Stance	Tibial torsion too internal	3,6	0,9
			Stance	Peroneus weakness	2,7	0,9
			Stance	Femoral anteversion increased	3,8	0,8

* Full reference: S. Dekker, A.I. Buizer, K. Wishaupt, H. Houdijk, M.M. van der Krogt; GAIT.SCRIPT: ontwikkeling van een interpretatietool voor klinische gangbeeldanalyse van kinderen met cerebrale parese; Nederlands Tijdschrift voor Revalidatiegeneeskunde, Februari 2022

Abbreviations of gait events and phases: IC, initial contact; LR, loading response (~0-10% gait cycle); EST, early stance (~10-30%); MST, midstance (~30%); LST, late stance (30-50%); PSW, preswing (~50-60%); ESW, early swing (~60-80%); LSW, late swing (~80-100%)

(v): item can best be determined from video rather than from 3D motion capture data

<<: related to (indirect cause)