Foot Pressure and Gait in Children with Cerebral Palsy

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Gait-Definition

- Repetitious sequences of lower limb motion to move the body forward while maintaining stance stability

Gait Evaluation

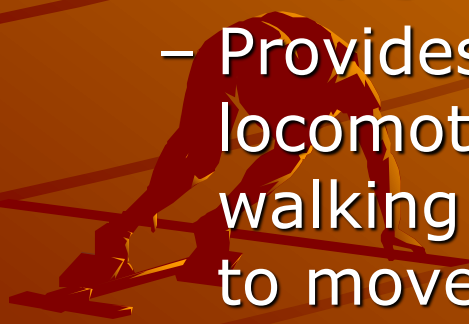
- Gait evaluation methods
- Low tech
  - Direct viewing
  - Video-taping
  - PT tests (5 minutes, 500 m, etc)
  - Visual gait scores
- High tech
  - Computerized 3D gait analysis

Cerebral Palsy

- A group of permanent disorders in the development of movement and posture causing activity limitations that are attributed to nonprogressive disturbances that occurred in the developing fetal or infant brain
- Motor disorders often accompanied by disturbances of:
  - Sensation
  - Perception
  - Cognition
  - Communication
  - Behavior
  - Epilepsy
  - Secondary Musculoskeletal problems

GMFCS

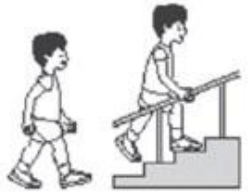
- The Gross Motor Functional Classification Scale (GMFCS)→ Palisano, R. *et al*. (1997)
  - Very good inter- and intra-rater reliability
  - Provides a means of describing children's locomotor function ranging from running and walking independently to requiring assistance to move a wheelchair
  - Has limitations- Distance walked
    - Child may be limited to a certain distance



GMFCS Scale

GMFCS for children aged 6–12 years:
Descriptors and illustrations

GMFCS Level I
Children walk indoors and outdoors and climb stairs without limitation. Children perform gross motor skills including running and jumping, but speed, balance and co-ordination are impaired.



GMFCS Level II
Children walk indoors and outdoors and climb stairs holding onto a railing but experience limitations walking on uneven surfaces and inclines and walking in crowds or confined spaces.

GMFCS Level III
Children walk indoors or outdoors on a level surface with an assistive mobility device. Children may climb stairs holding onto a railing. Children may propel a wheelchair manually or are transported when traveling for long distances or outdoor on uneven terrain.

GMFCS Level IV
Children may continue to walk for short distances on a walker or rely more on wheeled mobility at home and schoold and in the community.

GMFCS Level V
Physical impairment restricts voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Children have no means of independent mobility and are transported.

https://littleprincesscp.files.wordpress.com/2012/03/gmfcs-levels.jpg?w=467&h=598

FMS

- Functional Mobility Scale (FMS)→ Graham, H. *et al*. (2004)
  - Used to classify children who are ambulatory based on their walking ability at 5, 50, and 500 meters

FMS Scale

FMS 5m: the home setting			FMS 50m: the school setting			FMS 500m: the community setting		
Baseline	Probability of device at 5 yrs (CI)		Baseline	Probability of device at 5 yrs (CI)		Baseline	Probability of device at 5 yrs (CI)	
 Wheelchair or crawl (n=5)	w/c	0.129 (0 to 0.270)	 Wheelchair (n=5)	w/c	0.327 (0.147 to 0.507)	 Wheelchair (n=47)	w/c	0.681 (0.543 to 0.819)
	wkr	0.23 (0.074 to 0.387)		wkr	0.28 (0.145 to 0.415)		wkr	0.122 (0.027 to 0.216)
	cr	0.527 (0.337 to 0.037)		cr	0.366 (0.208 to 0.524)		cr	0.186 (0.083 to 0.289)
	ind	0.114 (0.006 to 0.22)		ind	0.027 (0 to 0.067)		ind	0.011 (0 to 0.034)
 Walker (n=16)	w/c	0.101 (0 to 0.203)	 Walker (n=29)	w/c	0.232 (0.113 to 0.352)	 Walker (n=6)	w/c	0.429 (0.273 to 0.582)
	wkr	0.204 (0.078 to 0.331)		wkr	0.265 (0.138 to 0.393)		wkr	0.147 (0.035 to 0.248)
	cr	0.595 (0.415 to 0.686)		cr	0.483 (0.323 to 0.602)		cr	0.4 (0.235 to 0.564)
	ind	0.14 (0.043 to 0.238)		ind	0.04 (0 to 0.095)		ind	0.031 (0 to 0.09)
 Crutches or sticks (n=26)	w/c	0.079 (0 to 0.157)	 Crutches or sticks (n=26)	w/c	0.16 (0.066 to 0.253)	 Crutches or sticks (n=7)	w/c	0.203 (0.053 to 0.357)
	wkr	0.179 (0.099 to 0.260)		wkr	0.249 (0.119 to 0.367)		wkr	0.143 (0.021 to 0.264)
	cr	0.575 (0.437 to 0.712)		cr	0.543 (0.394 to 0.691)		cr	0.589 (0.392 to 0.805)
	ind	0.168 (0.064 to 0.272)		ind	0.055 (0 to 0.129)		ind	0.059 (0 to 0.161)
 Independent (n=4)	w/c	0.06 (0 to 0.131)	 Independent (n=0)			 Independent (n=0)		
	wkr	0.156 (0.046 to 0.266)						
	cr	0.585 (0.446 to 0.725)						
	ind	0.199 (0.082 to 0.316)						

Grey shading represents clinically useful results based on numbers in each category and width of confidence intervals
w/c: wheelchair (FMS level 1); wkr: walker (FMS level 2); cr: crutches or sticks (FMS levels 3&4); ind: independent (FMS levels 5&6)

http://www.medicaljournals.se/jrm/content/files/web/1540-web-images/1540fig1_opt.jpeg

What we are looking at?

- Examining the gait and foot pressure of 25 children with Cerebral palsy (From Levels 1-3 on GMFCS Scale)
  - Gait
    - Using Low tech methods (video analysis)→ Completed by Dr. Givon
    - FMS and GMFCS
  - Foot pressure
    - Zebris (High Tech Treadmill)
- Aim→Compare our low tech evaluations to the high tech evaluations of these same patients
- The low tech method will be sufficient for certain analyses but will not be as accurate as the high tech method

Hypothesis

- The low tech method will be sufficient for certain analyses but will not be as accurate as the high tech method

Importance of ALL this

- Only 2 3D gait labs in the ENTIRE country of Israel
  - One here (Tel Hashomer)
  - Tel Aviv
- If proven valid, could allow for gait analysis throughout entire country
- Reduce travel for pts.
- Save $$$$$$