Gait-related Ground Reaction Forces in Charcot-Marie-Tooth (CMT) Disorder: A Family Case Study

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Background of CMT

- Neurological disorder affecting peripheral nerves
- Affects approximately 150,000 Americans
- Creates muscle atrophy due to degeneration of peripheral nerves
- Muscular atrophy creates problems with normal daily activities such as walking and maintaining balance

Purpose

- The purpose of this project was to detail the ground reaction forces and vertical force loading rates during gait of 3 siblings with CMT so that future research can target strategies for improving function and quality of life for individuals with CMT.

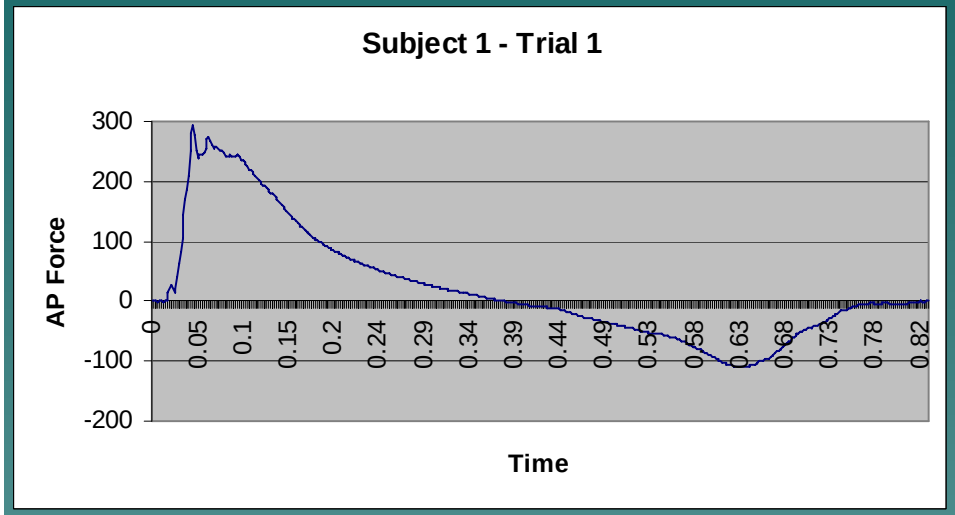
Methods

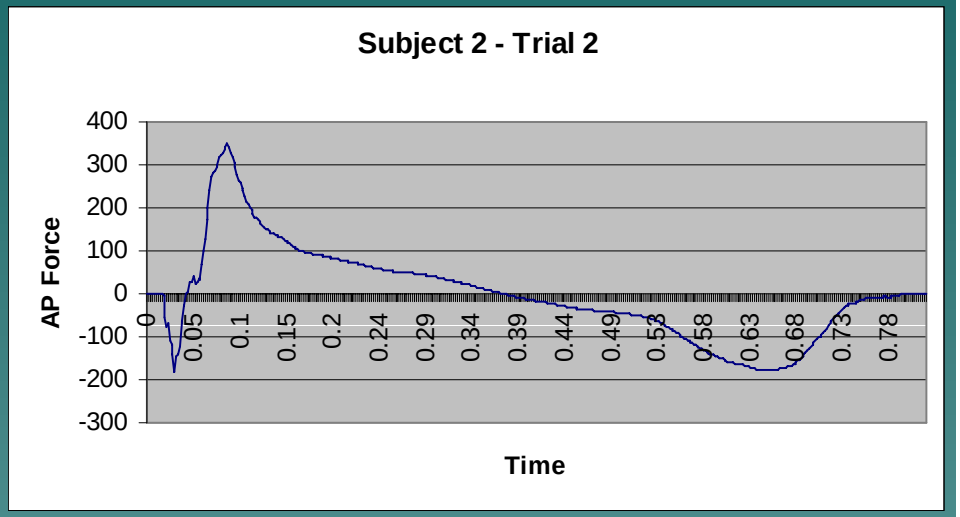
- Informed consent was obtained
- The subjects performed three walking trials at a self-selected pace
- An AMTI force plate (sampling at 600 Hz.) attached to a computer running the Peak Performance Motus motion analysis system was employed to collect and reduce the data to obtain the ground reaction force data.

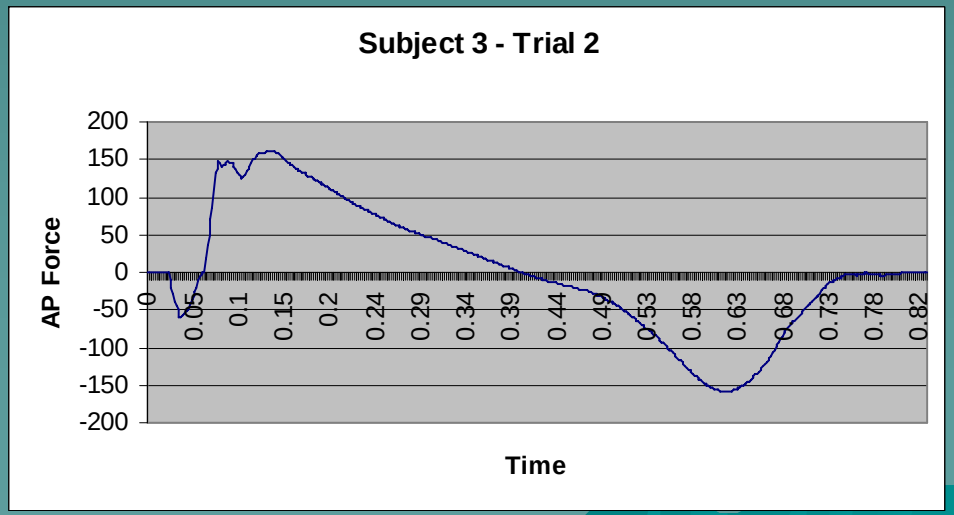
Subjects

Gender	Age	Height (meters)	Weight (Newtons)
Male	49	1.83	734.25
Male	43	1.78	778.75
Female	45	1.65	756.5

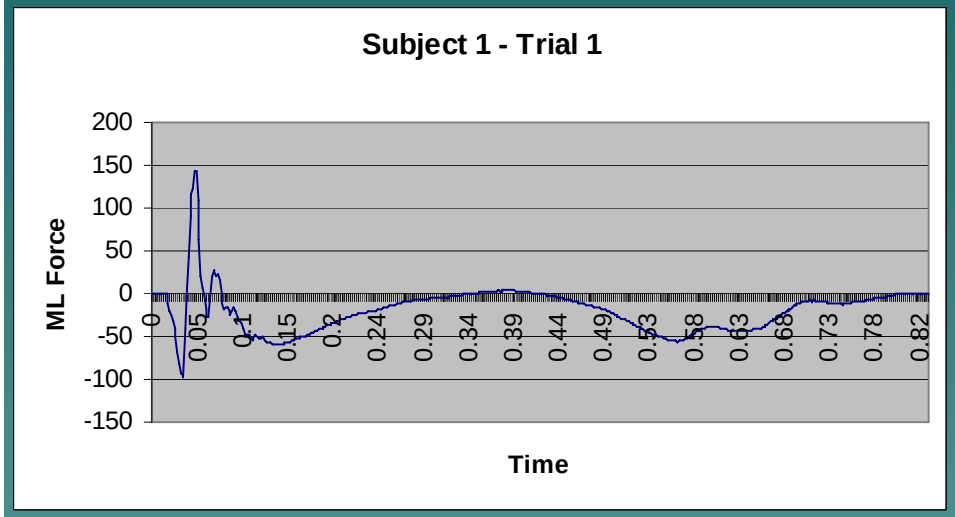
Results – Antero-posterior Force

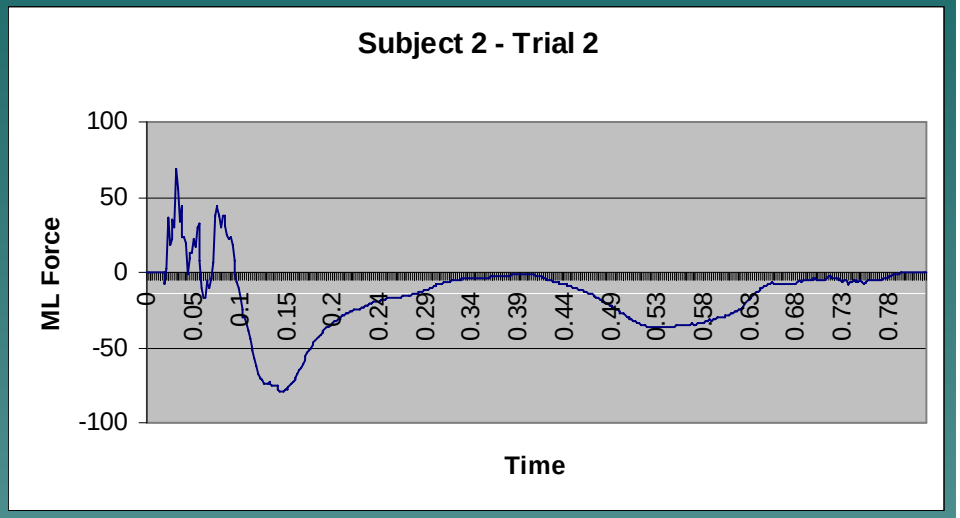


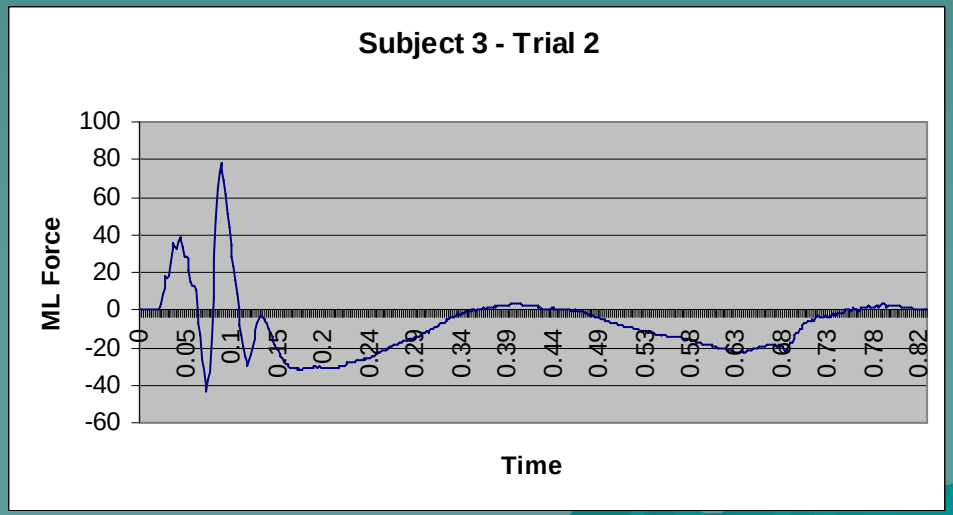




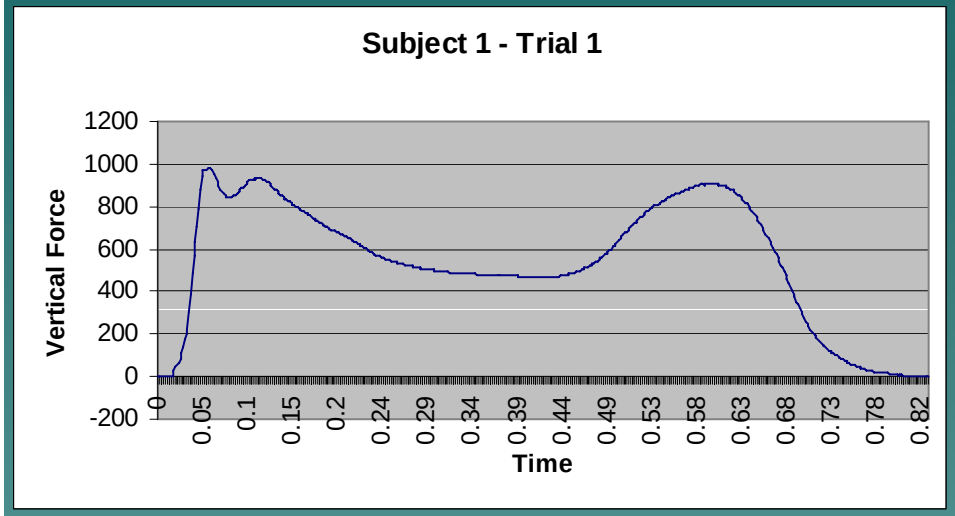
Results – Medio-lateral Force

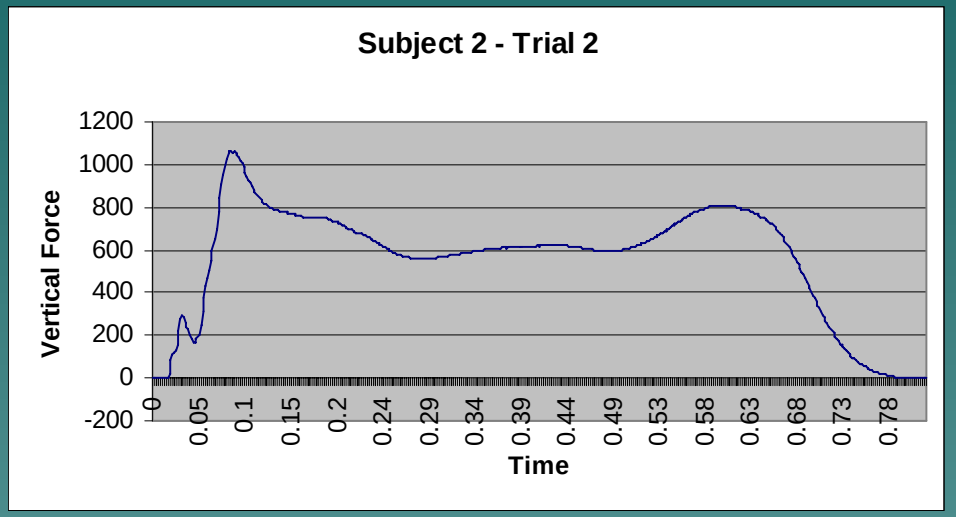


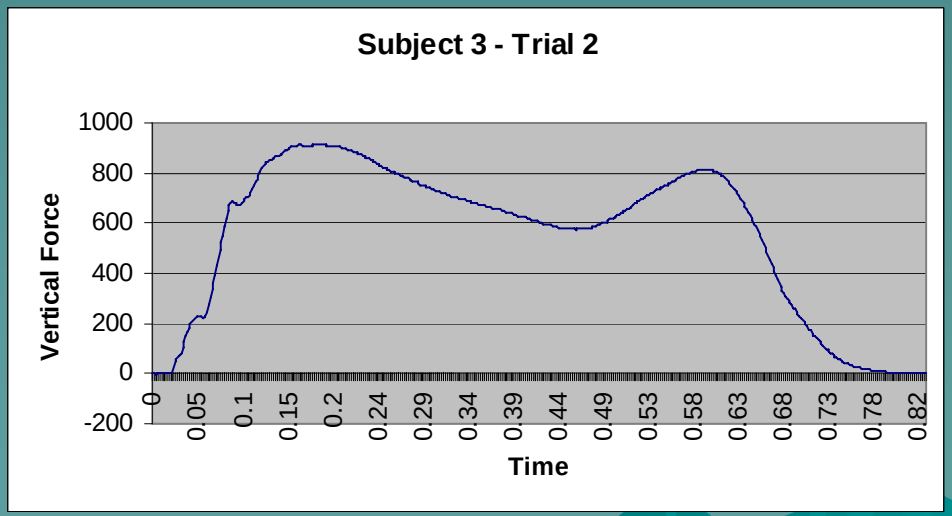




Results – Vertical Force







Results – Mean Peak Forces

Subject	ML Force (N)	% of BW	AP Force (N)	% of BW	Vertical Force (N)	% of BW
1	132.42	0.18	260.48	0.36	937.12	1.28
2	70.05	0.09	355.90	0.46	1071.57	1.38
3	56.91	0.07	169.75	0.22	926.55	1.22

Results – Loading Rate

Subject	Loading Rate 1 (N/s)	Loading Rate 2 (N/s)	Loading Rate 3 (N/s)
1	17312.02	8013.52	
2	8749.27	12783.53	
3	4346.28	7972.75	5292.90

Conclusions

- Results clearly show a different trend in ground reaction forces compared to “normal” subjects.
- Results show that each subject is different in their approach to dealing with the problems presented by the disorder.
- Vertical loading rates could present long term problems due to the lack of deceleration musculature.

Possible Interventions

- Balance training
- Muscular strength and endurance training
- Orthotics/Orthoses
- Medical interventions
- Other????

Questions?

- Thank you for your attendance