

# The Use of an Orthotic Garment System on a Pediatric Patient with Mitochondrial Disease Complex 1+3: A Case Report

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## Background

- Mitochondrial Disease (MD) is a progressive and debilitating disease that is characterized by a loss of efficiency in the electron transport chain and reductions in the synthesis of high energy molecules such as ATP.
- Orthotic garment systems also referred to as “TheraTogs®”, have been designed to act as a continuous somatosensory guide for proper functional alignment.
- Theratogs have been used in the pediatric population to treat Cerebral Palsy and Down Syndrome with excellent results but there is no known research regarding the benefits of TheraTogs® in individuals with MD.

## Purpose

- To investigate the use of the TheraTogs® System for postural control, with a pediatric patient with Mitochondrial Disease Complex 1+3.



## Patient History

- The patient was an 11 year-old child with a primary diagnosis of MD Complex 1+3. The patient presented with bilateral foot over-pronation, lower extremity internal rotation, knee hyperextension, increased hip flexion, and increased lumbar lordosis in standing. Impairments included decreased muscle strength, endurance and balance, impaired posture and abnormal muscle tone.

## Examination

Systems Review		Impairments	Functional Limitations	Disabilities
<b>Cardio/Pulm</b>	<ul style="list-style-type: none"> <li>BP: 100/62</li> <li>Normal S2, S2.</li> <li>No edema</li> </ul>	Decreased Strength	Abnormal gait pattern	Unable to participate in age appropriate recreation activities
<b>Integumentary</b>	Normal			
<b>Height/weight</b>	<ul style="list-style-type: none"> <li>64.4 lbs, 4 feet 6 in</li> <li>BMI: 15.3</li> </ul>			
<b>Posture</b>	<ul style="list-style-type: none"> <li>Bilateral foot over-pronation</li> <li>Slight bilateral hip flexion</li> <li>Increased lumbar lordosis</li> <li>Pt weight shifts right and increases trunk flexion when fatigued during ambulation and standing</li> </ul>	Increased LE muscle tone	Difficulty ascending and descending stairs	Unable to participate in activities that require transitioning from the floor to standing
<b>Gross ROM</b>	<ul style="list-style-type: none"> <li>Full functional ROM bilateral upper and lower extremities</li> <li>Noted bilateral hamstring tightness</li> </ul>	Decreased UE muscle tone	Difficulty maneuvering up and down ramps and curbs	
<b>Gross Strength</b>	<ul style="list-style-type: none"> <li>Decreased strength globally</li> <li>Poor trunk control</li> </ul>	Impaired balance, balance, posture, trunk control and gait	Difficulty maintaining static positions required to transition from floor to standing	
<b>Tone</b>	<ul style="list-style-type: none"> <li>Decreased bilateral UE and trunk muscle tone</li> <li>Increased bilateral LE muscle tone</li> </ul>	Limited Endurance		
<b>Gait</b>	<ul style="list-style-type: none"> <li>Mildly ataxic, Walks briskly with occasional loss of balance on even surfaces and frequent loss of balance on uneven surfaces with bilateral AFO's</li> <li>Bilateral in-toeing with increased pronation</li> </ul>			

## Outcomes

- With support of the TheraTogs®, the patient was able to perform all activities with improved postural control and endurance.
- Following 8 weeks of treatment, the patient was able to get into each test position independently and also independently maneuver stairs, curbs and ramps and was becoming more engaged with peers.

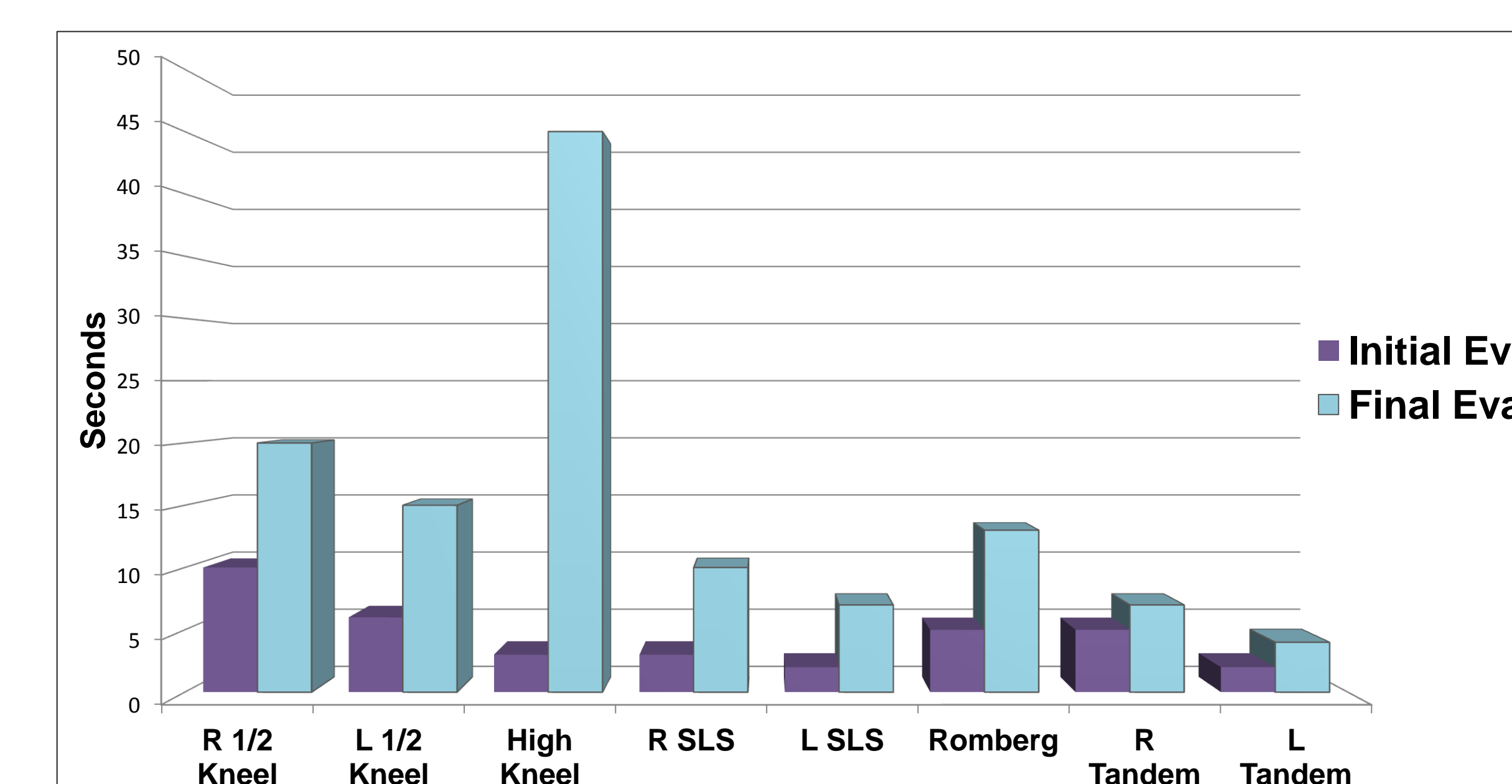


Figure 1 Comparison of timed balance activities during the initial and final examination

## Interventions

Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8
Quad bean bag toss	Quad weighted ball toss	Single Leg Stance timed	Quad weighted ball toss	Single leg standing toe taps	Theratogs worn	Theratog straps needed to be realigned	Gait training with squeak pads
Quad weighted ball toss	½ kneel weighted ball toss	High/ ½ kneel with fine motor activities	High kneel weighted ball toss	Theratog adjustment	Practiced safe transitioning: quad, ½ kneel, high kneel	Transitions: ½ kneel, high knee	Transitions through ½ kneeling to standing with 2 hand support
Stairs	Bolster swing push offs/kick	Quad weighted ball toss	Step kicks with soccer ball	SLS on uneven surface	Speed walking on uneven surface	½ kneel, high kneel weighted ball toss	Reciprocal crawling, creeping, bear walking up incline
Gait training with squeak pads	High kneel/quad drawing	High kneel overhead throws	Step kick with large ball to target	Single leg standing toe taps reassessed	Over hand throwing to target, each hand	Crab walk, fwd and backward creeping on wedge	Single leg stance timed
Treadmill	Treadmill	Kicking small/large ball to target	Timed balance: SLS, tandem, 2 feet narrow	Treadmill		Single leg standing toe taps	Single leg standing toe taps
		Bolster swing push off/kick	Treadmill			Step throws with weighted ball: each hand	Assisted sit-ups
		Treadmill	*Theratogs received, education given on strap placement			Obstacle Course	Wheel barrow walking on
						All activities performed barefoot	Treadmill

## Discussion

- The use of TheraTogs improved alignment, functional ability, and endurance in an 11 year-old pediatric patient with MD Complex 1+3.
- Further research should focus on investigating the benefits of TheraTogs® in younger and older patients with Mitochondrial Disease.

## References

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- How TheraTogs Work. TheraTog's Web site. [www.theratogs.com](http://www.theratogs.com)