



EXERCISE MANAGEMENT WITH A PATIENT WITH CEREBRAL PALSY, CASE REPORT

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Introduction

- Cerebral Palsy (CP) is the **most common childhood physical disability**, impacting an estimated 2.3 to 3.6 of every 1000 live births in the U.S.
- Common primary impairments include alterations in muscle tone, motor coordination, and postural stability. Secondary impairments include decreases in range of motion, **decreased forced production**, and decreased endurance.
- Muscle weakness has been identified as one of the primary deficits contributing to motor dysfunction in CP
- Individuals with CP may benefit from the same exercise training principles as their non-disabled peers, such as **specificity of strength training, adaptation, overload, progression, & individualized training programs**

Case Profile *11 year old male with right spastic hemiplegic CP*

Initial Presentation:

•Ambulation: independent ambulator with normal cognition and effective communication skills. Demonstrates over-pronation with increased calcaneal valgus and slight internal rotation of the RLE. Observed circumduction of the RLE and flat foot initial contact during gait.

Outcomes:

•Ambulation: demonstrates improved heel toe progression and increased foot clearance during ambulation when using SureStepSMO and KiddiGait. Heel toe progression is further improved with the use of the Bioness L300.



- Strength measured using standard MMT: UE is WFL, hip flexion 3+/5, hip abduction 3/5, hip extension 3+/5, knee extension 3+/5, knee flexion 3+/5 dorsiflexion 0/5 with no active contraction. Unable to perform a sit up without assistance from UEs
- Popliteal angle = -35 degrees with the hip flexed to 90 degrees.
- 30 degrees of active dorsiflexion and 0 degrees of passive dorsiflexion (able to attain neutral).
- Able to balance on his RLE for 2 sec with eyes open and 1 sec with eyes closed.
- Stairs: He ascends and descends stairs using a reciprocal pattern with one upper extremity on railing.
- Six-minute Walk Test Distance: 241 meters

- Strength: Patient demonstrated increases in strength of LE musculature: Hip flexion 4-/5, hip abduction 3+/5, hip extension 3+/5, knee extension 4-/5, knee flexion 4/5, dorsiflexion 0/5.
- Popliteal angle =-28 degrees with the hip flexed to 90 degrees.
- -30 degrees of active dorsiflexion and 3 degrees of passive dorsiflexion.
- Able to balance on RLE for 5 seconds with eyes open and 1 sec with eyes closed.
- Stairs: Able to ascend and descend the stairs using a reciprocal pattern without hand support.
- Six-Minute Walk Test Distance: 297 meters

Interventions *1x weekly for 45 minutes*

Week 1	Initial Evaluation
Week 2	Treadmill ambulation forward 1.6 mph, incline 5 x 6 min, backwards 0.9 mph x 3 min, side stepping at 0.6 mph x 1 min each way. Manual stretch to hamstrings in supine 1 min x 3 reps. Standing gastrocnemius slant board stretch 1 min x 3 reps. Soft tissue massage/myofascial release to right hamstrings/gastrocnemius. Sidelying clam shells RLE 12 reps x 2 sets. Stair climbing, 12 stairs x 2 reps. Application of kinesiotape to right tibialis anterior.
Week 3	Bike level 1 x 5 min. Standing gastrocnemius slant board stretch 1 min x 3 reps. Manual hamstring stretch in supine 1 min x 3 reps. Bridges 10 reps x 2 sets. Side lying clam shells RLE with yellow theraband 10 reps x 2 sets. Soft tissue massage/myofascial release to right hamstrings /gastrocnemius. Orthotist present to measure and cast patient.
Week 4	Soft tissue massage/myofascial release to right hamstrings/gastrocnemius. Manual supine hamstring stretch 1 min x 3 reps. Standing gastrocnemius stretch 1 min x 3 reps. Applied kinesiotape to right tibialis anterior. Treadmill training at 1.7 mph and incline 5 x 6 minutes, backward 0.9 walking x 3 minutes, side stepping 1.5 minutes each. Bridges 12 reps x 2 sets. Stair climbing 12 stairs x 3 reps.
Week 5	Patient absent.
Week 6	Patient fit with Bioness right LE unit using quick-fit electrodes applied to anterior tibialis. Assessed effectiveness in clinic, on treadmill at 1.5 mph at both incline 0 and incline 5. Assessed ankle stability with Bioness activations during single leg stance rebounder ball toss activity. Tolerated 30 mA intensity.
Week 7	Assessed fit of new KiddieGait AFO and SureStep SMO. Ambulation with Bioness device over level ground and on treadmill. Treadmill forward 1.7 mph incline 5 x 7 min, backward 1.0 mph x 4 min, side-stepping to the right and left 1.0 mph x 3 minutes each way. Bridges 10 reps x 3 sets. Side-lying clamshells RLE with yellow theraband 10 reps x 3 sets. Stair climbing 12 stairs x 4 reps.
Week 8	Re-Evaluation. Sidelying clamshells with red theraband 12 reps x 2 sets. Bridges 10 reps x 3 sets.

Discussion: Strength training has been controversial in the CP population due to the fear that it could possibly increase muscle spasticity, but research indicates individuals with CP can make gains in strength without impacting their spasticity or ROM.

This patient made small strength gains over 7 weeks. It is possible these gains were due to neural adaptations, motor learning, and increased muscle fiber recruitment, and not muscle hypertrophy. The exercises were chosen to improve strength and endurance.

Although he did not gain active dorsiflexion ROM or strength, he did increase his dorsiflexion passive ROM, indicating that it is possible for children with CP to make improvements in strength and flexibility simultaneously.

