Quadriciser

Case Study

Effect on Walking Efficiency in Adolescents with Cerebral Palsy

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PURPOSE: The purpose of this experiment is to determine the effects that the Quadriciser has on walking efficiency in adolescents with cerebral palsy.

METHODS: Two participants with cerebral palsy participated in the study. Each participant completed one seven-week passive exercise intervention using the Quadriciser. Participants were asked to walk a distance of 84 feet both pre and post intervention to measure improvement in walking efficiency.

Participant one has Spastic Quadriplegia and **participant two** has Mixed Quadriplegia. Both subjects experience fluctuating levels of motor control and use a gait trainer during the prescribed walking task. Neither have cognitive limitations and fully understand both the task and the intervention.

Quadriciser Use

Pre testing of walking efficiency (distance of 84 feet)

- **Exercise Time:** 30 minutes daily (data taken once a week)

- **Speed**: 30 RPM

- **Description of Exercise:** Simultaneous Shoulder Extension and Flexion; Elbow Extension and Flexion; Knee Flexion; Ankle Dorsiflexion

Post testing of walking efficiency (distance of 84 feet)

Pre-Post walking times for a distance of 84 feet were taken with a stopwatch as well as recorded through video analysis.

Participant 1 -Pre/Post Walking Efficiency Times

Week	Pre-time	Post-time	Change*	Percentage
Week 1	1 minute 8 seconds	50 seconds	18 seconds	+ 26.5%
Week 2	59 seconds	58 seconds	1 second	+ 1.7%
Week 3	1 minute 32 seconds	1 minute 2 seconds	30 seconds	+ 32.6%
Week 4	1 minute 5 seconds	56 seconds	9 seconds	+ 13.8%
Week 5	1 minute 16 seconds	48 seconds	28 seconds	+ 36.8%
Week 6	1 minute 2 seconds	57 seconds	5 seconds	+ 8.0%
Week 7	1 minute	53 seconds	7 seconds	+ 11.7%

**Positive numbers indicate positive change in subject's pre/post walking efficiency times*

Participant 2 -Pre/Post Walking Efficiency Times

Week	Pre-time	Post-time	Change*	Percentage
Week 1	57 seconds	49 seconds	8 seconds	+ 14.0%
Week 2	1 minute 43 seconds	1 minute 15 seconds	28 seconds	+ 27.2%
Week 3	1 minute 41 seconds	1 minute 33 seconds	8 seconds	+ 7.92%
Week 4	1 minute 19 seconds	40 seconds	39 seconds	+ 49.4%
Week 5	48 seconds	50 seconds	-2 seconds	- 4.16%
Week 6	1 minute 9 seconds	35 seconds	34 seconds	+ 49.3%
Week 7	1 minute 6 seconds	56 seconds	10 seconds	+ 15.2%

**Positive numbers indicate positive change in subject's pre/post walking efficiency times*

RESULTS: Both participants showed consistent positive change when comparing their pre and post intervention walking times. The Quadriciser appeared to have the greatest impact on walking efficiency during weeks where participants demonstrated extreme spasticity pre-intervention. Preliminary data may suggest the Quadriciser has a sustained positive impact on walking efficiency.

CONCLUSIONS: The Quadriciser was shown to produce a positive change in subject's walking efficiency. Further research must be conducted to determine if exercising on the Quadriciser will produce a sustained impact on movement efficiency long term.

Background Reference:

-Cerebral palsy (CP) is often associated with muscle weakness and gait impairments. Children with CP generally expend a greater amount of energy to walk than typically developing children, resulting in an inefficient gait. (Pouliot-Laforte, A., Parent, A., & Ballaz, L., 2014)

-People with high and low muscle tone may see beneficial effects in strength, range of motion, or fluidity of motion following a passive exercise protocol (Cho et al., 2012; Cordo et al., 2008; Herbold et al., 2014; Lenssen, 2008; Shin et al., 2012).

-Pouliot et al. (2014) concluded interventions that focused on greater knee flexion and as well as greater force production of the knee and ankle lead to greater gait efficiency in participants with Cerebral Palsy.

-The Quadriciser is a therapy device that will simultaneously exercise all four limbs in an active or passive motion consistently. The walking pattern of the Quadriciser moves the user's lower and upper limbs through varying ranges of motion which have impact on an individual's overall health by increasing circulation, heart rate, range of motion, strength, muscle tone, balance, bowel and bladder function as well as improving psychological well being (Quadriciser Corporation, 2000).

-A previous study using the quadriciser indicated that there may be positive effects on range of motion and fluidity of motion in people with muscle tone challenges (Frank & Moran, 2017; Sergiano & Moran, 2017; Moran, 2014).