Effects of Quadruped Movement in an Individual with Chronic Stroke: A Case Study

Maureen Pascal, Emily Connell, Alyssa Pratti, Kristina Russell

Numerous functional parameters **improved** in an individual with **chronic stroke** following a **quadruped based** intervention program.

Phase 1 of Intervention: Sessions 1 - 8
Focus: Set the foundation with wrist mobility, dynamic stretches, static and dynamic activation exercises to increase strength and endurance

Phase 2 of Intervention: Sessions 9 - 16
Focus: Increase the difficulty, increase dynamic exercises and introduce more challenging exercises, circuits and flows

Timed Bear Crawl
- 41.8% improvement in timed forward crawl
- 24.82% improvement in timed reverse crawl

Grip Strength
- 19.5% increase in left hand strength

Six-Minute Walk Test
- 3.35% increase in distance ambulated
- Increase in distance without quad cane

Posture
- 53.9% improvement in effective head weight
- Improvement observed in trunk extension

Patient Specific Functional Scale
- No significant changes noted

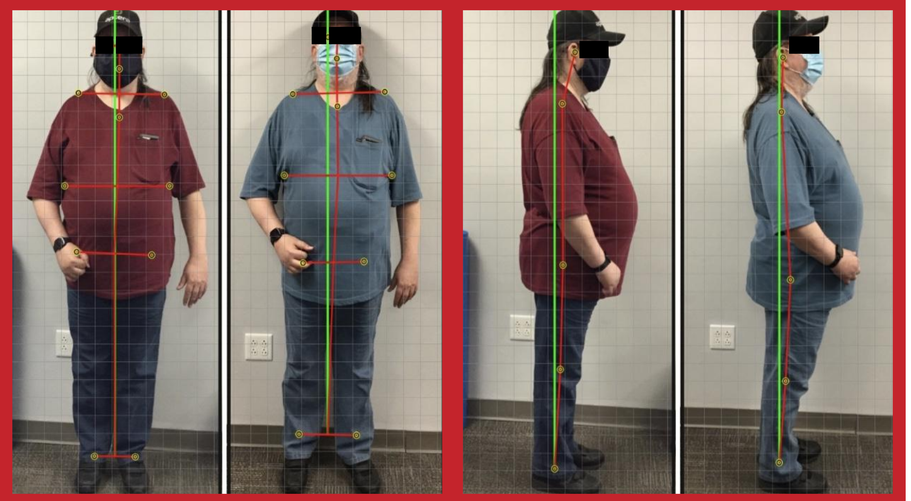
MISERICORDIA UNIVERSITY

Scan for References

Scan for Exercises

Gait

Velocity (cm/sec)	Left Step Length (cm)	Step Length Ratio (L/R)	% Right SL Support	% SL Support Ratio (L/R)	Integrated Pressure Ratio (L/R)
With Quad Cane: Normal Speed					
4%	1%	< 1%	6%	6%	10%
With Quad Cane: Fast Speed					
12%	1%	2%	8%	8%	4%
Without Quad Cane: Normal Speed					
4%	1%	2%	8%	8%	4%
Without Quad Cane: Fast Speed					
5%	1%	8%	3%	11%	4%



Subject Characteristics
- 57 year old male sustained a left middle cerebral artery stroke in 2011
- At baseline:
  - Impaired balance
  - Utilizes a right ankle-foot orthosis
  - Ambulates with a rollator or quad cane
  - Right-sided weakness with upper extremity involvement greater than lower extremity involvement

Big Picture

Where do we come in?
1. Identify Animal Flow as an existing form of exercise that may be beneficial for use in stroke rehabilitation
2. Recognize the qualities of Animal Flow that limit its feasibility for direct use in patients with neuromuscular dysfunction
3. Develop a modified quadruped-based program that tailors the principles of Animal Flow towards the deficits seen in an individual with chronic stroke

Our program
- A form of constraint-induced therapy that forces use of the hemiplegic side of the body by having the patient work in variations of the quadruped position.

Why Does Our Research Matter?

Neuroplasticity continues to occur well beyond initial injury
- With purposeful interventions, guided by the principles of neuroplasticity, improvements noted 11 years following stroke

Task specificity promotes the greatest percent change
- All patient impairments and limitations should be considered when designing treatments

Patient specificity is crucial to patient participation
- Equipment modifications to account for reduced mobility
- Intensity was reduced for safety, but remained challenging enough to promote neuroplasticity and functional improvements

Implications for other diagnoses
- Osteoporosis and Cerebral Palsy
  - Weight bearing promotes increase in bone mineral density
- Nonspecific Low Back Pain
  - Traveling movement in quadruped promotes greatest muscle fiber activation of transversus abdominis and lumbar multifidus
  - Improves postural control and balance
- Spinal Cord Injuries
  - Improves strength, postural control, endurance, motor control and proprioception

Modified quadruped based movement would be beneficial to incorporate into physical therapy practice.