



The Effect of a Periodized Resistance Training (RT) Program on Strength and Ambulation in an Individual with Incomplete Chronic Spinal Cord Injury



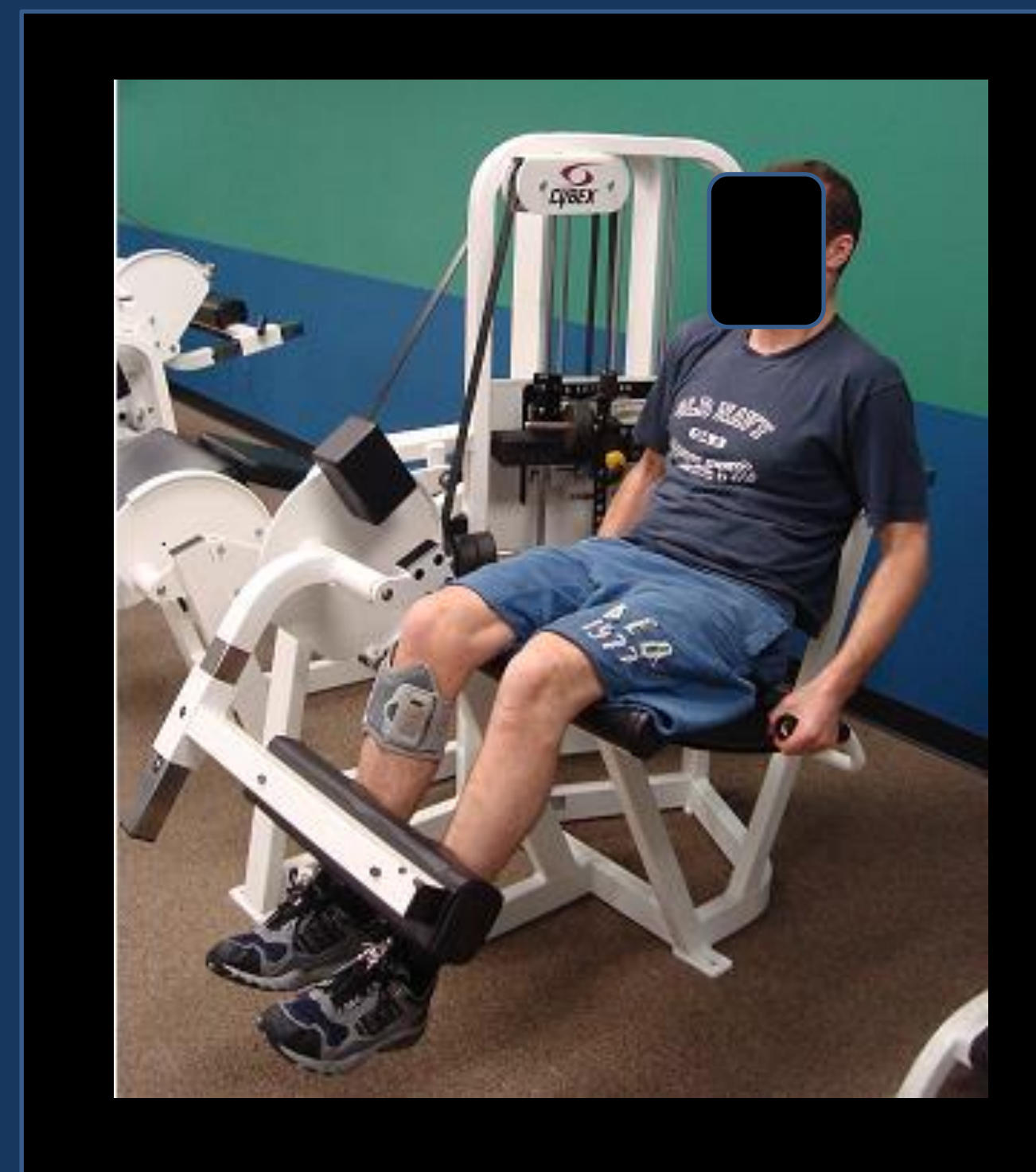
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Periodization

An approach to resistance training that includes planned variations in volume, intensity, recovery time, and frequency of exercises in different stages or “mesocycles” in order to optimize strength gains, prevent muscle damage, and improve the body’s ability to adapt at varying capacities.

Introduction

- Muscle atrophy is a primary health concern in individuals suffering from spinal cord injury (SCI).
- This negative consequence is a result of the injury and results of subsequent limitations in mobility.
- Muscle weakness has also been evidenced to cause pain and dysfunction with aging in persons with disability due to SCI especially as an individual with SCI ages.
- Participation in exercise has been shown to reduce the prevalence of secondary complications and improve quality of life in those with SCI.
- Professionals who work with individuals with SCI should strive to better understand the individual’s potential by focusing on the best method to improve functional abilities and promote physical fitness



Purpose

- To determine the effectiveness of using a periodized resistance training program to develop strength and enhance ambulation for an ambulatory individual with chronic incomplete SCI.
- To evaluate the effectiveness and viability of utilizing periodized training for increasing strength and reducing muscle atrophy in individuals with chronic SCI.
- To assess if RT has an effect on muscle spasticity after SCI.

Methods

- A 38 year old male with a chronic L1 SCI and paraparesis
- The participant was ambulatory with the assistance of bilateral canes, dorsiflexion-assist ankle cuffs, and an electronic stimulation unit on his right leg
- Twelve weeks of whole body periodized RT on selectorized equipment was performed by the participant
 - The 12 week program was divided into three separate mesocycles
 - Each mesocycle had its own training specific goal
- RT occurred two times each week
- Cardiovascular endurance training on a body weight supported treadmill took place once a week
- Flexibility exercises were performed by the participant following each training session
- A traditional periodization schema was followed beginning with high volume, low intensity training and progressing to low volume, high intensity training
- Both pre and post intervention outcome measures were completed and included:
 - 1 repetition maximum (1RM) strength testing
 - 6-minute walk test
 - Manual muscle testing
 - Modified Ashworth test
 - Body composition analysis
 - Range of motion assessment

Results

- For each of the three mesocycles the participant made positive gains in muscular endurance, strength, and power as evidenced by increases in the volume of each training session and the total volume of the mesocycle (see figures 1,2, and 3).
- Load-volume was calculated by multiplying the weight lifted in each exercise in a training session by the number of repetitions providing a single unit of work performed at each session.

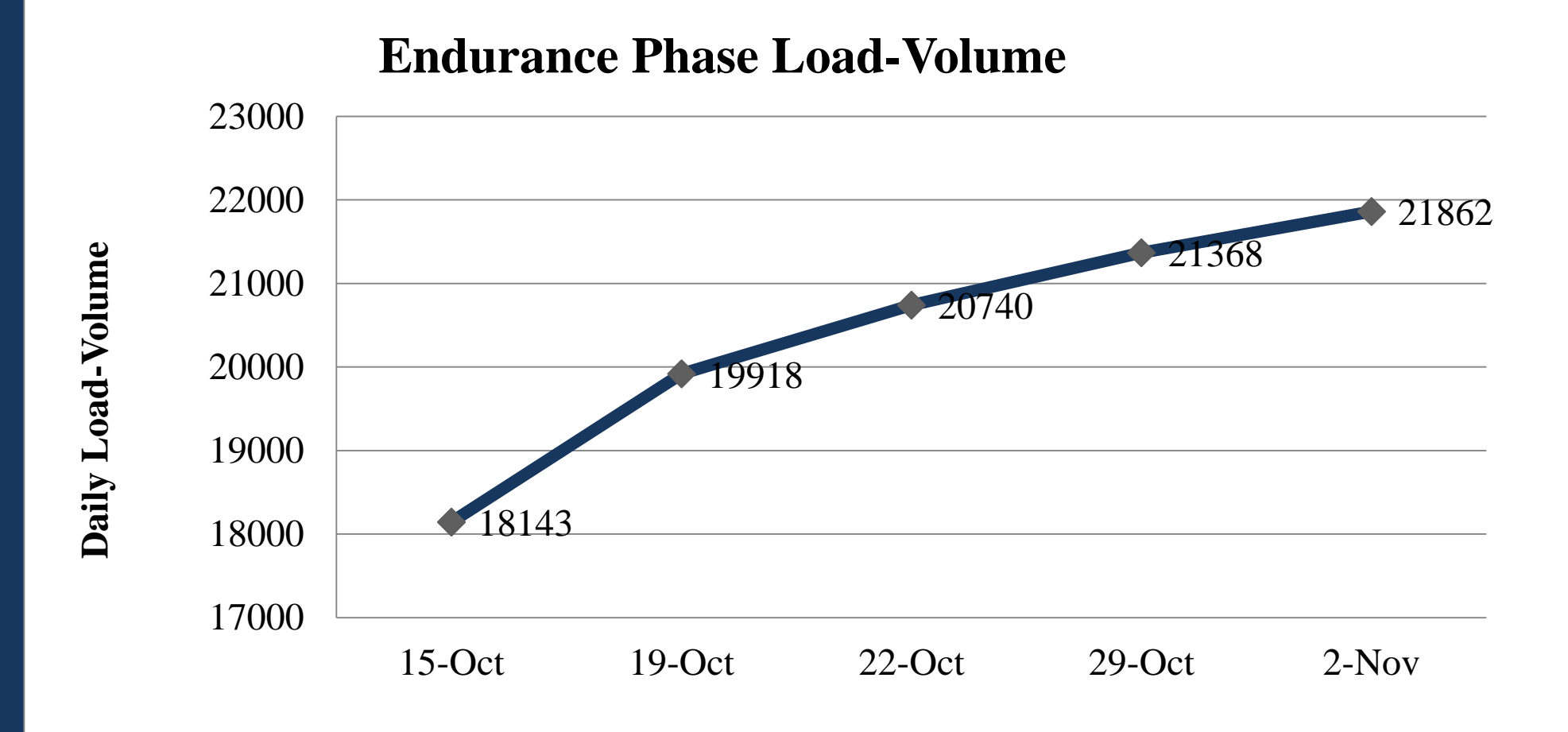


Figure 1

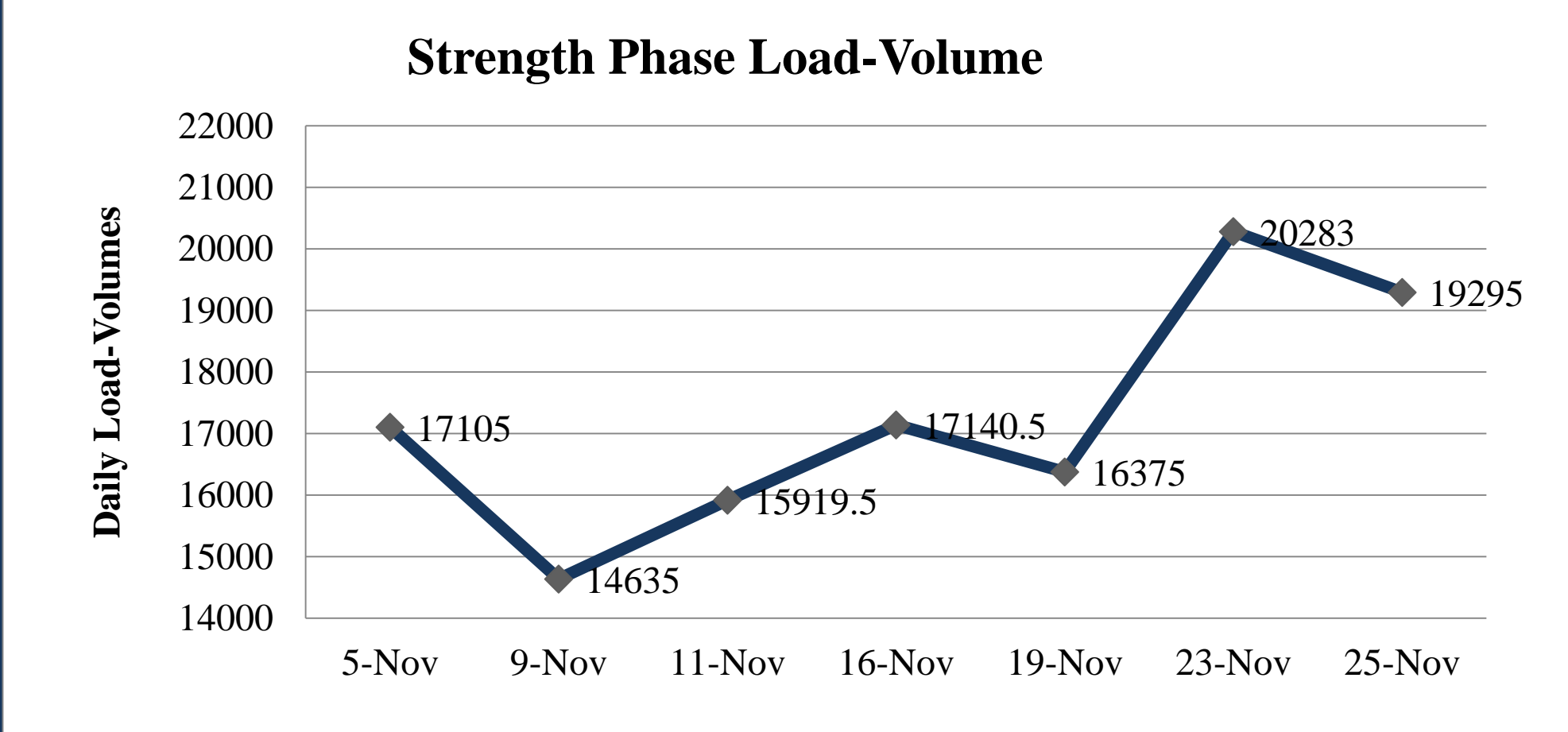


Figure 2

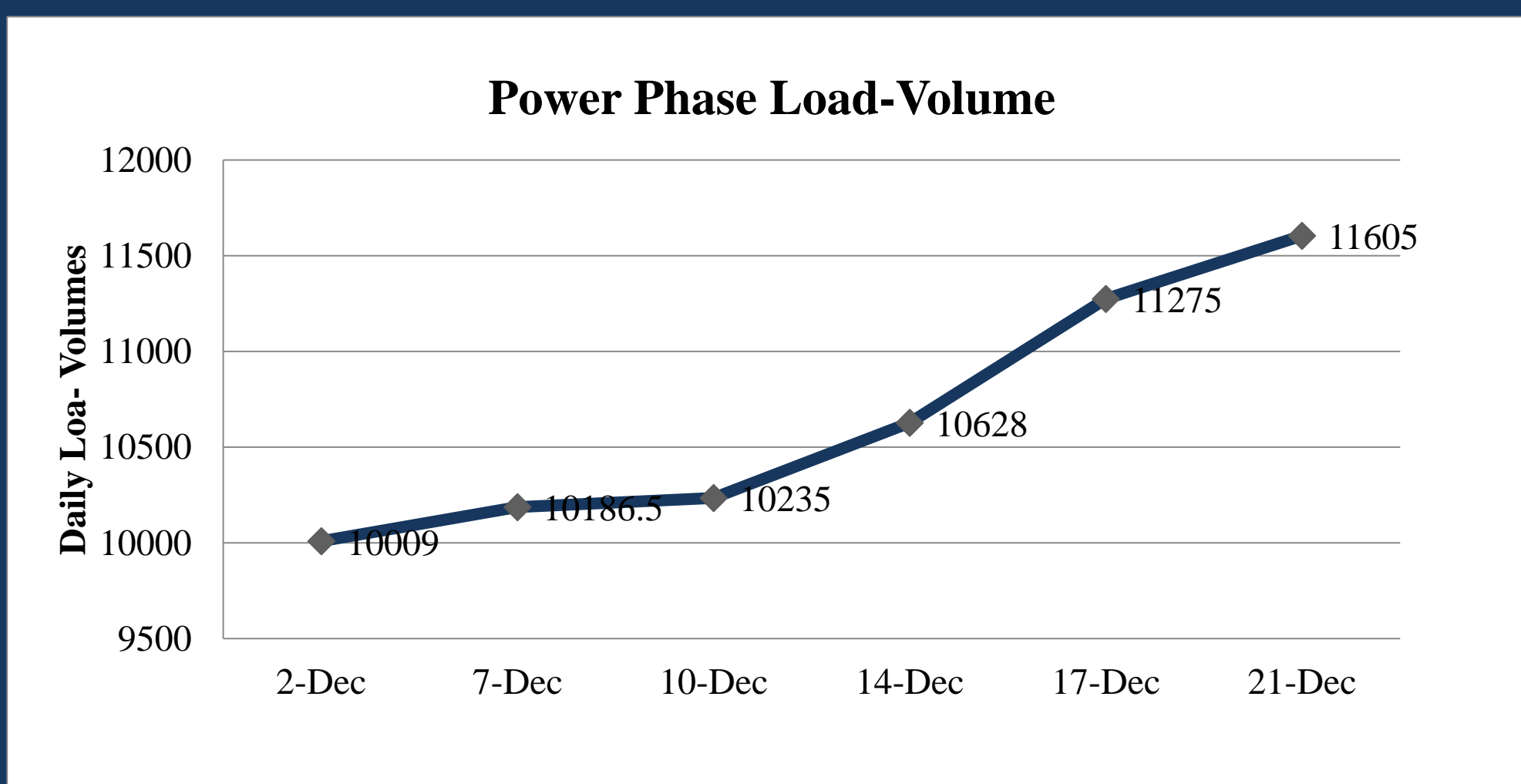


Figure 3

- Pre/Post tests for upper body strength showed an increase in upper body strength of **22%** as determined by 1RM
- Pre/Post tests for lower body strength showed an increase in lower body strength of **13%** as determined by 1RM

1 Repetition Maximum Tests			
	PreTest	Post Testing	Δ (pounds)
Chest Press	135	165	30
Leg Press	195	220	25

- 6-minute walk test was performed pre and post intervention. The participant was able to walk **107 feet farther** at post testing
- No other significant trends were noted.

6-minute Walk Test				
	Total Distance	Δ (feet)	Speed (feet/s)	Δ (feet/s)
Pre	1103 ft		3.06	
Post	1210 ft	+107	3.36	+0.98

Conclusion

- Participant gained strength as evidenced by increases in both upper and lower body 1RM scores.
- Participant made improvements in 6-minute walk test times as demonstrated by pre/post test data, potentially indicating increased functional improvements in ambulation distance, endurance, and walking speed.
- Participant made gains in muscular fitness as determined by increases in muscular endurance, strength, and power training volume increases during each mesocycle.
- Periodized training for the SCI population appears to be a viable, however further study is needed with the SCI population.

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Periodization Mesocycles					
Goals	Length of Cycle (weeks)	Sets	Repetitions	Recovery Time Between Exercises	Intensity (% 1-RM)
Muscular Endurance	3	3	12-15	30 seconds	50% 1-RM
Strength	4	3	6-8	2-3 minutes	80% 1-RM
Power	4	3	3-5	2-3 minutes	45% 1-RM