

The Effects of Alter-G (Anti-Gravity Treadmill) Training on Ambulation for a Person with a Chronic Spinal Cord Injury

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INTRODUCTION

Individuals with incomplete spinal cord injuries (i.e. paraparesis) have the potential to improve walking ability through rehabilitation. Paraparesis is a spinal cord injury that is incomplete and primarily impacts the legs. Several methods of rehabilitation have been effective in improving ambulation. In this case study an anti-gravity treadmill (AlterG) was utilized. The Alter-G is an unweighting system that uses differential air pressure technology to reduce loading on its users. The AlterG can support up to 80% of its users body weight. The amount of unweighting can be adjusted to provide more or less support as needed by the individual.

The effects of the AlterG on patients with incomplete spinal cord injuries have not been well researched. For an individual who walks laboriously, the AlterG can potentially provide a safe environment. This case study was developed to help understand the feasibility, efficacy, and opportunity for use of the AlterG in training people with paraparesis.

OBJECTIVES

- The study was utilized to determine if the anti-gravity treadmill is a viable option for training people with chronic spinal cord injuries.
- Additionally the study investigated if there were residual effects provided to the participant after training on the AlterG

RESEARCH QUESTIONS

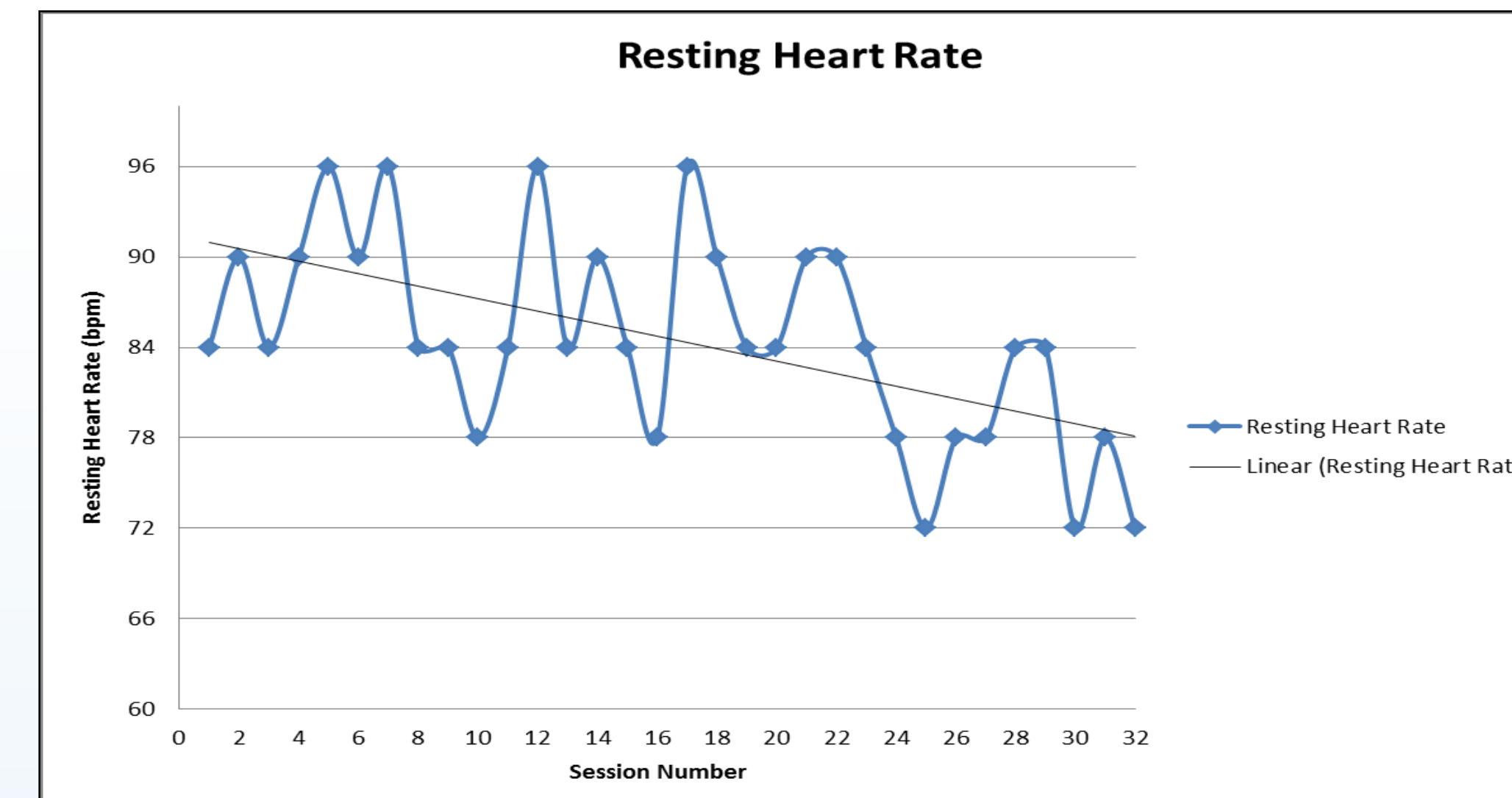
- What are the effects of training on the AlterG on walking and general fitness of a person with chronic paraparesis?
- Is there a residual effect from training on the Alter G after a 4 week recovery period for a person with chronic paraparesis?



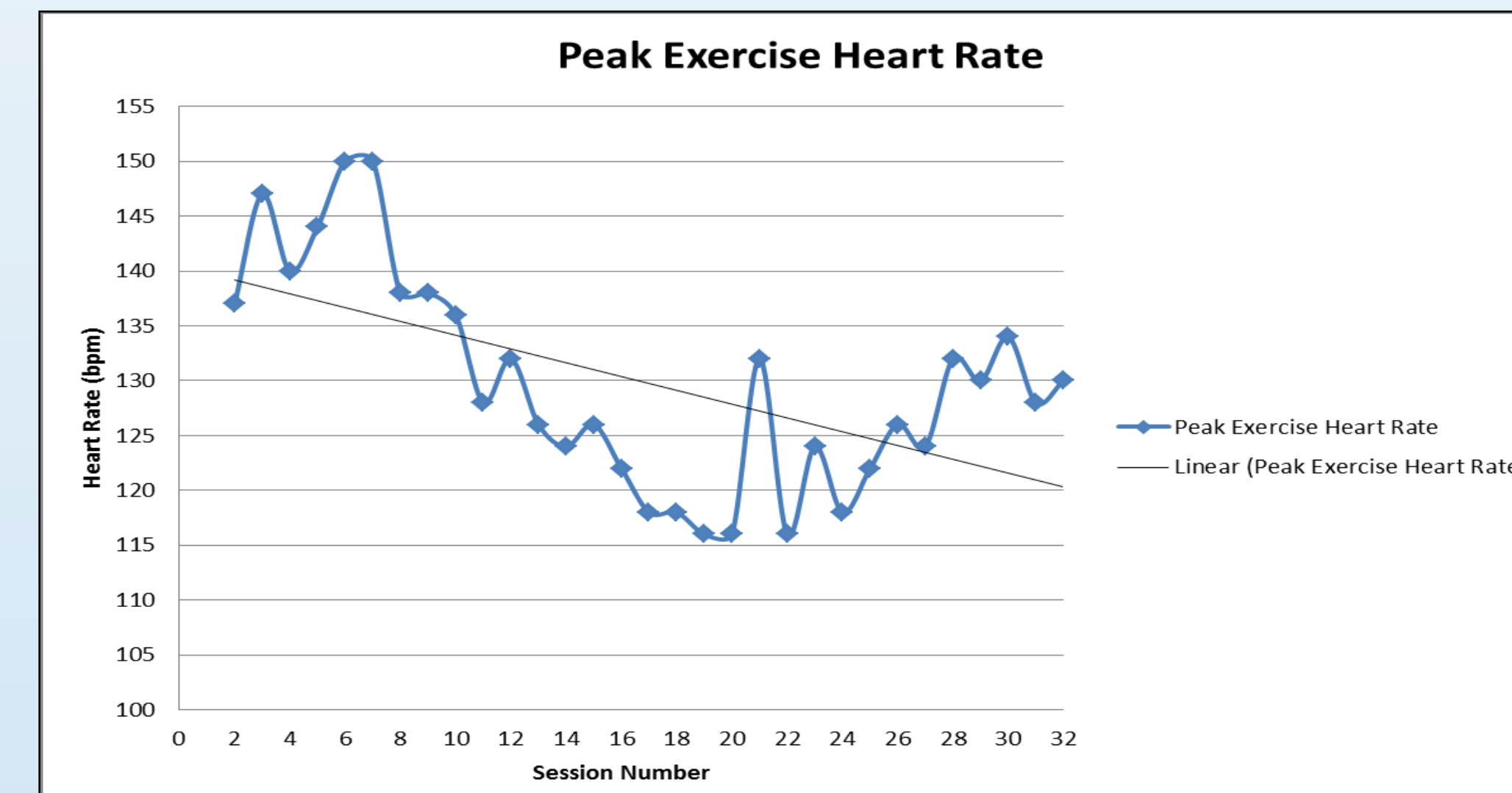
METHODS

- A 38 year old medically stable male with paraparesis from an accident that occurred 8 years ago was used in this study. He did not have any indications of other medical comorbidities that would limit moderate exercise.
- Participant was medically cleared for moderate intensity physical activity.
- Participant presented as ambulatory using 2 crutches and an electronic stimulation unit on his right leg.
- Pretests completed were gait analysis, 6-minute walk test, resting heart rate, and resting blood pressure.
- Training began at 55% of the participant's body weight supported by the Alter-G.
- Progression was made utilizing increases in body weight and treadmill speed to produce an appropriate heart rate response and walking speed
- Total exercise time, percent of body weight utilized, rate of perceived exertion, pre and post exercise heart rate and blood pressure were recorded during each session.
- Training occurred twice per week for 16 weeks with a 4 week recovery period after the initial 8 weeks
- Upon completion of the 16 week program, gait analysis, 6-minute walk test, resting heart rate, and resting blood pressure were assessed.
- Informed consent, and IRB approval was attained prior to the start of the study.

RESULTS



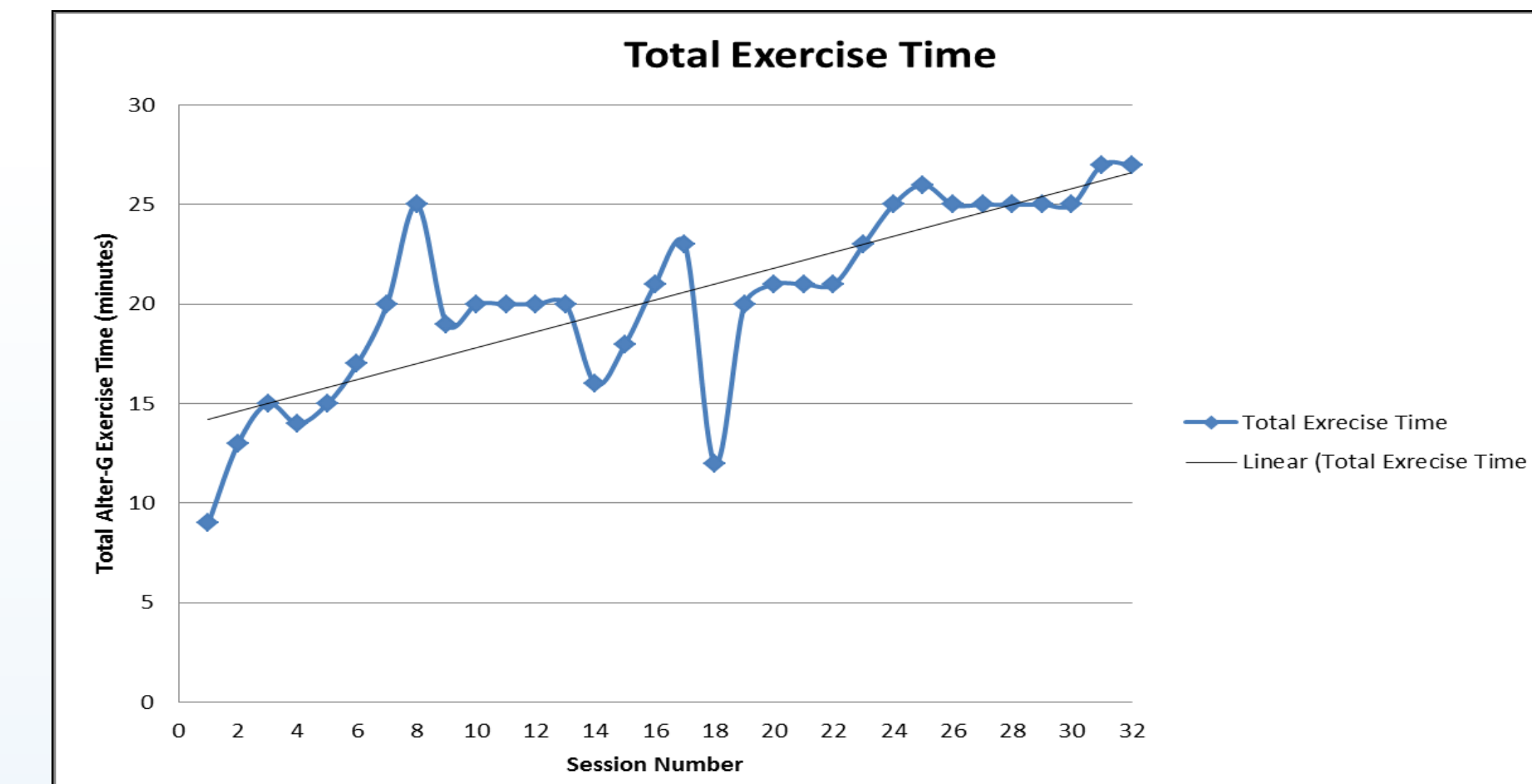
- Initial resting heart rate was 90 bpm
- Post intervention resting heart rate was 78 bpm
- Between sessions 16 and 17 there was 4 weeks where the participant did not train.



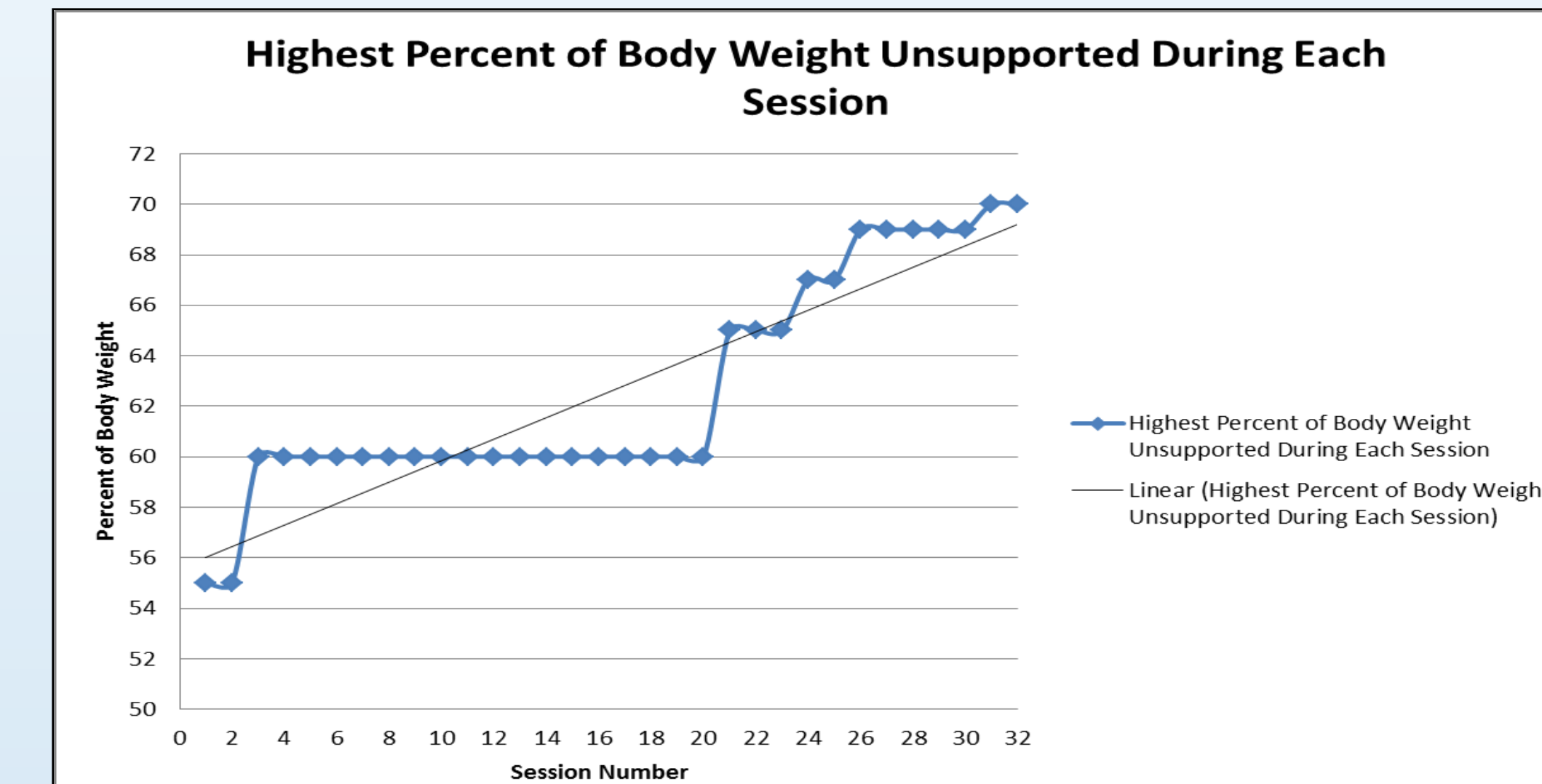
- Initial peak exercise heart rate was 140 bpm
- Post intervention peak exercise heart rate was 130 bpm
- Despite an increase treadmill speed, body weight supported, and exercise duration the participant continued to show improvement in exercise heart rate response.

| Six Minute Walk Test | | | | | | | | | | | | | |
|----------------------|-----------|------------------|--------|------|---------------------------------|-----------------------|--------------------|----|-----------------------------------|-----|-----|-----|-----|
| | Date | Resting measures | | | Number of 75 ft. laps completed | Total distance walked | RPE before / after | | HR (bpm) during test: Minutes 2-6 | | | | |
| | | HR | BP | SPO2 | | | 2 | 3 | 4 | 5 | 6 | | |
| INITIAL | 5/6/2013 | 72 | 124/84 | 98 | 11 | 856 ft. | 10 | 14 | 138 | 152 | 158 | 158 | 162 |
| POST | 9/25/2013 | 78 | 128/86 | 98 | 14 | 1103 ft. | 10 | 12 | 146 | 155 | 154 | 155 | 158 |

- Six minute walk test was performed pre and post 16 week intervention.
- The participant was able to walk 247 feet further post intervention



- Total exercise time per session increased from 9 minutes in session 1 to 27 minutes in session 32



- Unsupported body weight increased from 55% to 70% over the 16 week study

CONCLUSION

- Training a participant with a chronic spinal cord injury on the Alter-G demonstrated that this type of training is a viable option for this participant
- Increases in exercise intensity through treadmill speed, amount of body weight supported, and duration of exercise time were experienced. Also noteworthy was a decrease in resting heart rate and peak exercise heart rate during the intervention. The increased intensities and decreased heart rates suggest improvement in walking capacity, walking quality, and cardiovascular fitness.
- Pre and post 6 minute walk tests suggest an increase in walking efficiency.
- However, residual effects for the participant after the 4 weeks of recovery were not evident.