



IS THERE A DIFFERENCE IN ACUTE MEMORY RETENTION BETWEEN MAXIMAL TREADMILL EXERCISE AND MAXIMAL ERGOMETER EXERCISE?

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Abstract

INTRODUCTION: Physical activity can have positive effects on the proper functioning of the brain. A single bout of exercise may stimulate plasticity within the cortex, a portion of the brain with a unique applicability to reconstruct memory. There are a couple key components of the physiological effects of exercise on the brain that may control the improvements in memory. During a single bout of exercise, heart rate and stroke volume increase to pump more oxygenated blood throughout the body. Elevated cardiac output results in increased cerebral blood flow, which stimulates elevated electrical activity within the brain. A rise in frequencies throughout the brain correlates with improvements in cognitive function, an increased ability to learn, and an improved ability to recall or remember.

PURPOSE: The purpose of this study was to assess the differences in acute memory retention between maximal treadmill exercise and maximal ergometer exercise.

METHODS: Five healthy males (age 26.8 ± 7.56 years), that were students at the University of Texas at Arlington participated in this experiment. Upon arriving at the lab, their age, height and weight were measured and recorded. They were given 3 minutes to memorize a recording of 15 words from the Rey's Auditory Verbal Learning Test played to them through an SMS recording. After listening to the recording, they were asked to immediately recall as many words as possible in 3 minutes pre-exercise. A heart rate monitor was attached to their chest to allow measurement of heart rate. Then they stood on the treadmill (TM) or cycle ergometer (ERG) while the headgear was fitted to their head in order to hold the mouthpiece in place. The mouthpiece was used along with a nose clip, ensuring that exhaled air could be collected in the metabolic cart during the exercise. Rate of perceived exertion score (RPE) with ratings from 6 (rest) to 20 (maximal exercise) was taken during each workload, while the heart rate (HR) and volume of oxygen consumed (VO₂) was monitored every minute. The treadmill increased in speed and elevation every three minutes until exhaustion while the ergometer increased in resistance every minute until exhaustion. In the recovery stage, the treadmill and ergometer were slowed down to allow the heart rate to slow down, and when they felt recovered, they were allowed to get off of the treadmill or ergometer. They were then asked to recall as many words as possible in 3 minutes post-exercise.

RESULTS: The number of words memorized pre-test were: [ERG: 11.2 ± 3.42 ; TM: 9.6 ± 3.58]. The number of words memorized post-test were: [ERG: 11.4 ± 4.04 ; TM: 9.8 ± 4.97]. The results of the t-test indicated that there was no statistical significant difference between the two methods of exercise on memory ($p = 0.1951$).

CONCLUSION: The results of this experiment suggest that maximal exercise on the ergometer does not provide a higher retention rate than maximal exercise on the treadmill. These findings might be due to the broad range in age of the subjects and the small sample size used for this project. Further research would be necessary to determine if different modes of exercise affects acute memory retention.

Purpose

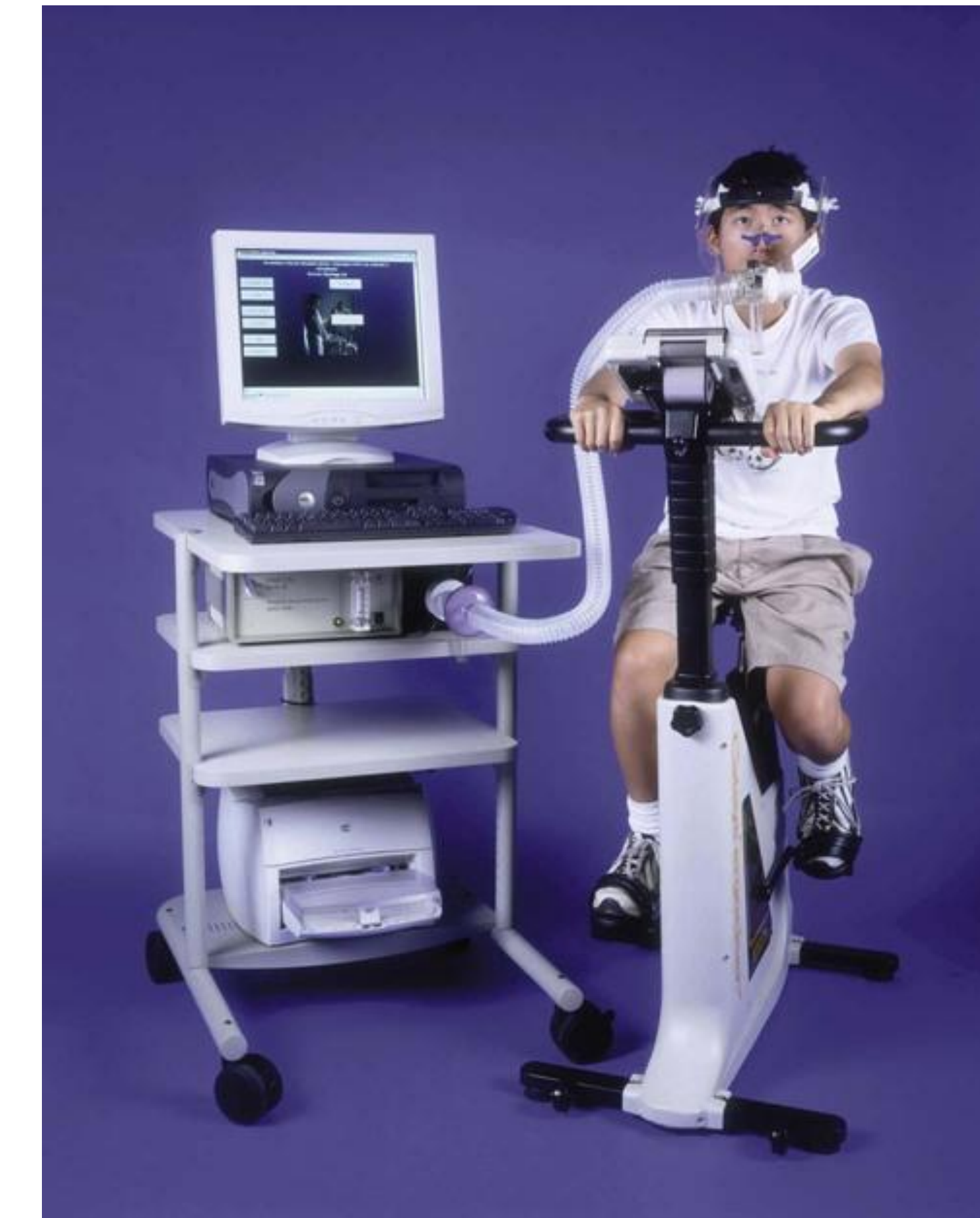
The purpose of this study was to assess the differences in acute memory retention between maximal treadmill and maximal ergometer exercise.

Methods

Five healthy males (age: 26.8 ± 7.56 years; height: 181.8 ± 7.26 cm; weight: 85.66 ± 11.42 kg), that were students at the University of Texas at Arlington participated in this experiment. Upon arriving at the lab, their age, height and weight were measured and recorded. They were given 3 minutes to memorize a recording of 15 words from the Rey's Auditory Verbal Learning Test played to them through an SMS recording. After listening to the recording, they were asked to immediately recall as many words as possible in 3 minutes pre-exercise. A heart rate monitor was attached to their chest to allow measurement of heart rate. Then they stood on the treadmill (TM) or cycle ergometer (ERG) while the headgear was fitted to their head in order to hold the mouthpiece in place. The mouthpiece was used along with a nose clip, ensuring that exhaled air could be collected in the metabolic cart during the exercise.

Methods (cont'd)

Rate of perceived exertion score (RPE) with ratings from 6 (rest) to 20 (maximal exercise) was taken during each workload, while the heart rate (HR) and volume of oxygen consumed (VO₂) was monitored every minute. The treadmill increased in speed and elevation every three minutes until exhaustion while the ergometer increased in resistance every minute until exhaustion. In the recovery stage, the treadmill and ergometer were slowed down to allow the heart rate to slow down, and when they felt recovered, they were allowed to get off of the treadmill or ergometer. They were then asked to recall as many words as possible in 3 minutes post-exercise.

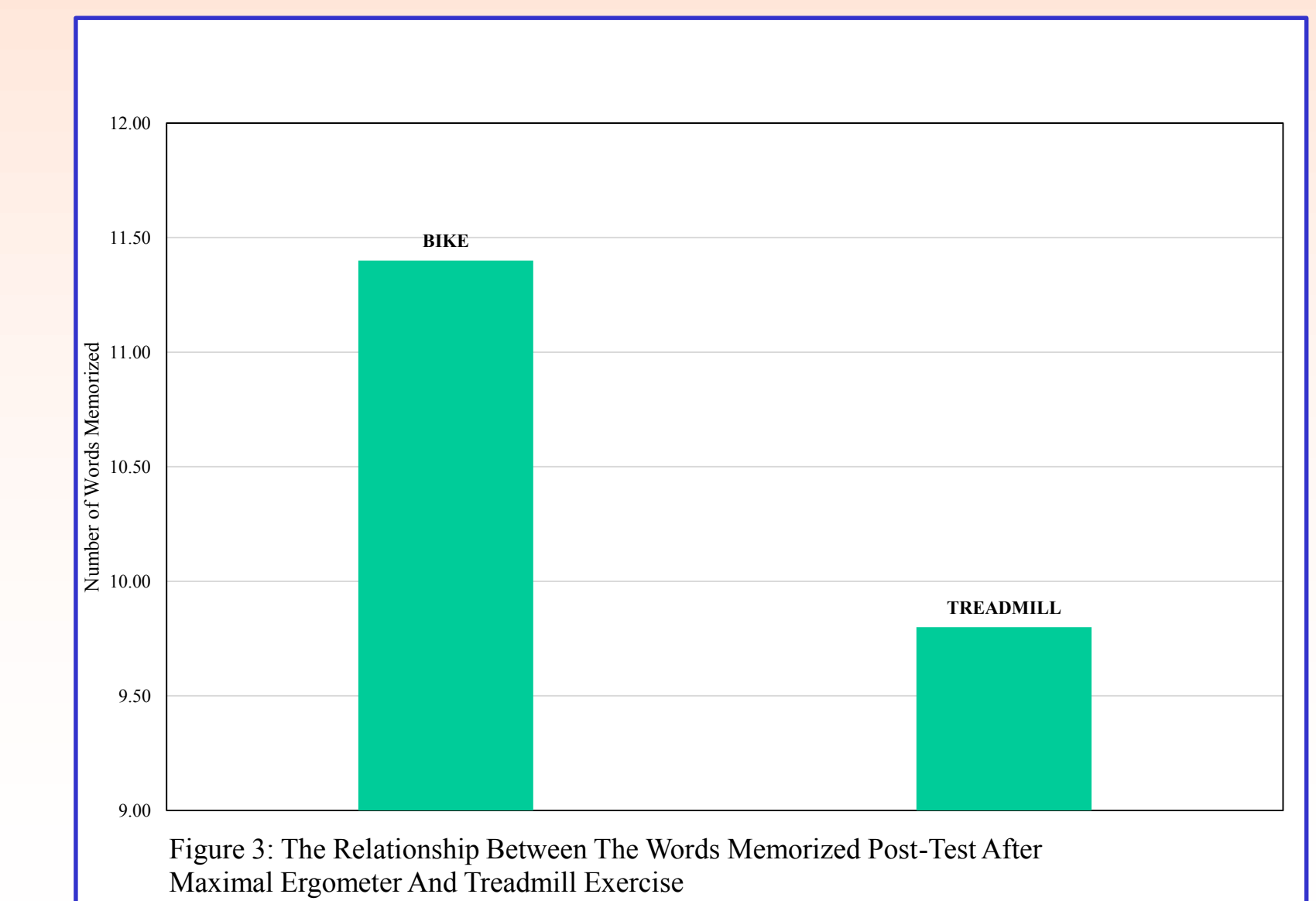
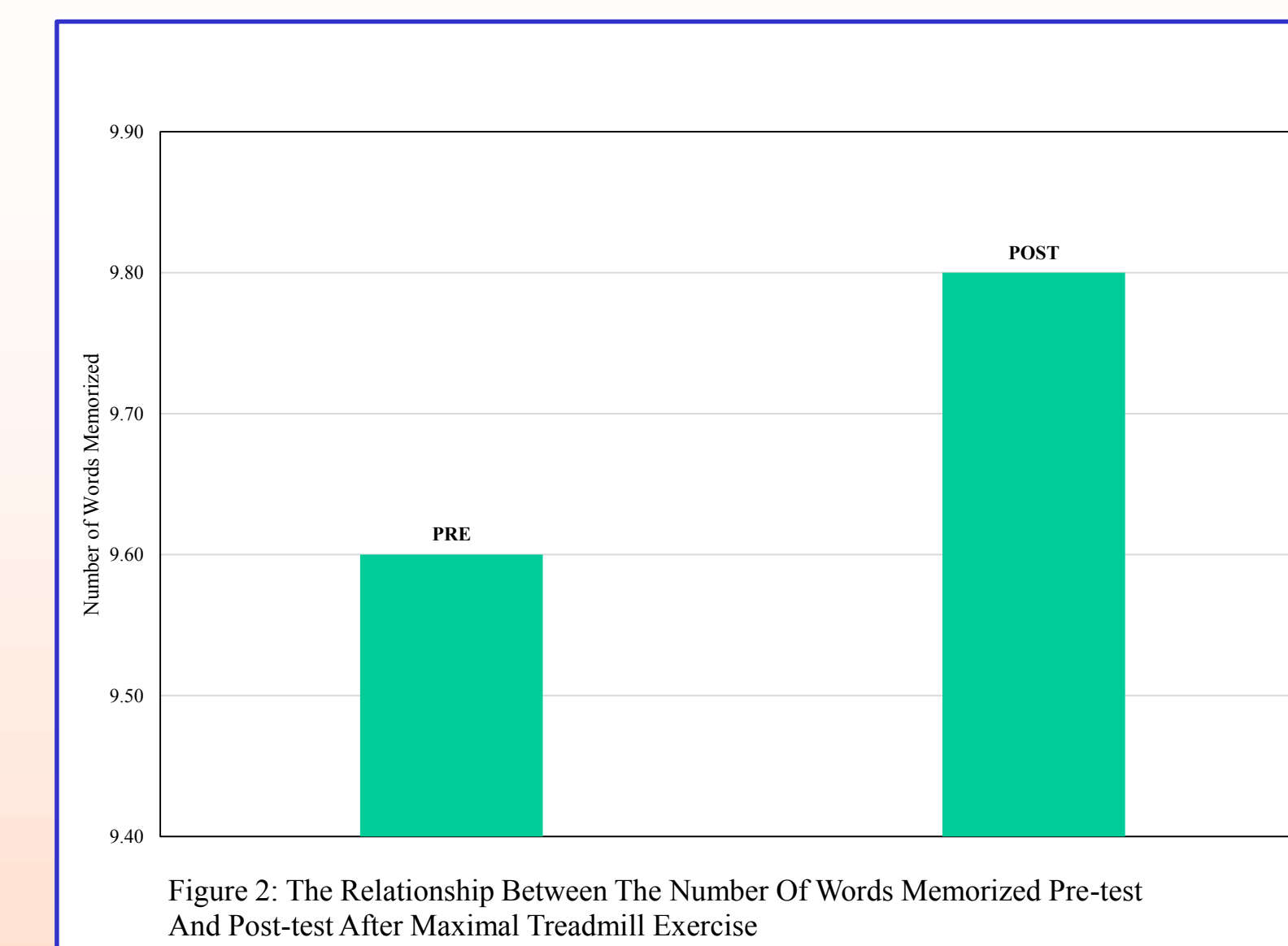
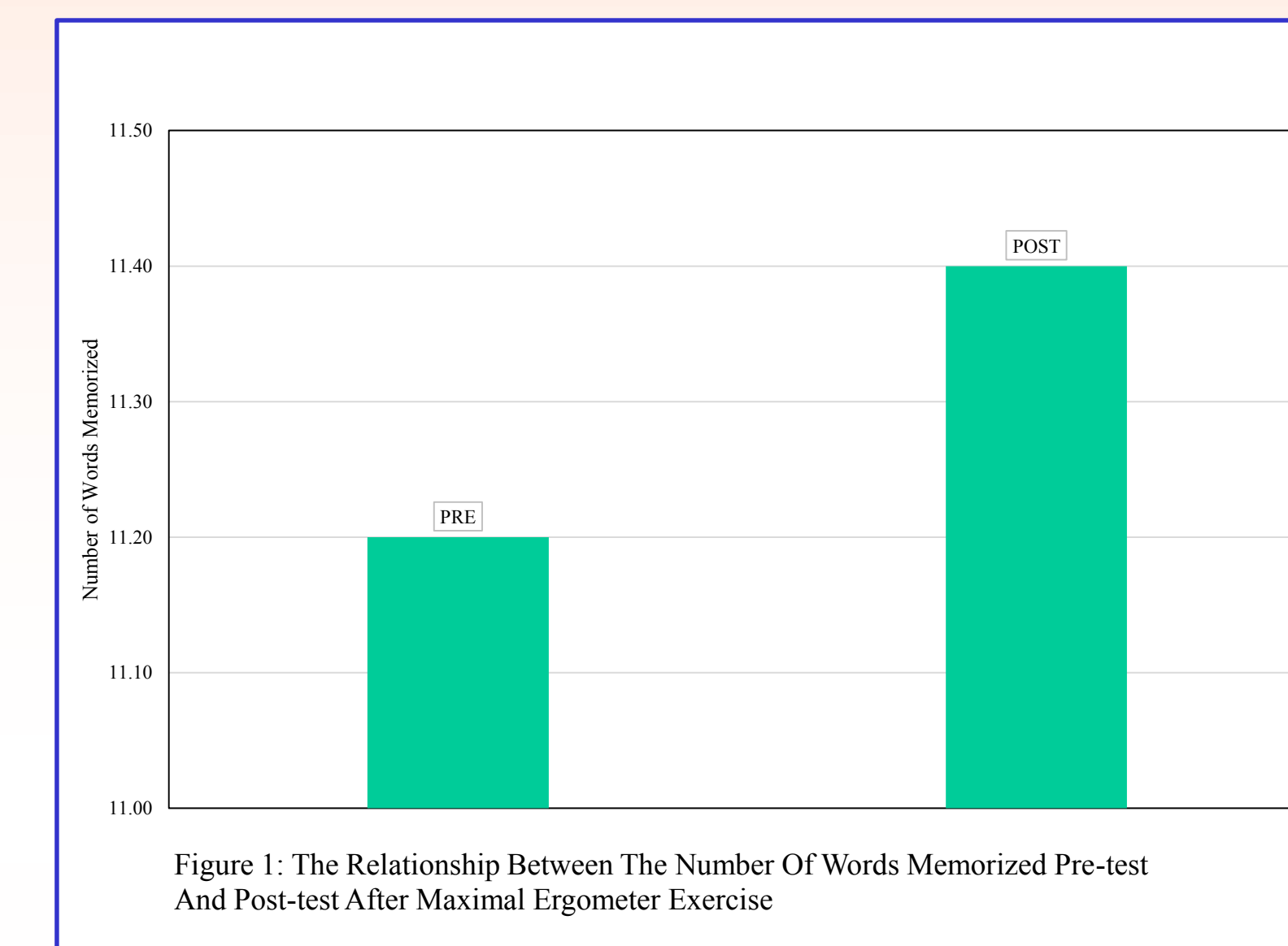


Results

The number of words memorized pre-test were: [ERG: 11.2 ± 3.42 ; TM: 9.6 ± 3.58]. The number of words memorized post-test were: [ERG: 11.4 ± 4.04 ; TM: 9.8 ± 4.97]. The results of the t-test indicated that there was no statistical significant difference between the two methods of exercise on memory ($p = 0.1951$).

Results (cont'd)

	Mean	SD	Max	Min
Age (yrs)	26.8	± 7.56	39	19
Height (cm)	181.8	± 7.26	193	180
Weight (kg)	85.66	± 11.42	104.0	75.0
BMI (kg/m ²)	25.89	± 2.73	29.07	23.08



	Bike	Treadmill	p value
VO ₂ max (mL/kg/min)	30.22 ± 11.47	40.40 ± 9.03	0.0159
HR max (bpm)	154 ± 20.43	179.6 ± 5.68	0.0327
RPE max	15.4 ± 2.7	14.6 ± 2.19	0.4050

Conclusions

The results of this experiment suggest that maximal exercise on the ergometer does not provide a higher retention rate than maximal exercise on the treadmill. These findings might be due to the broad range in age of the subjects and the small sample size used for this project. Further research would be necessary to determine if different modes of exercise affects acute memory retention.