FINAL REPORT

November 2011

Comparative Skeletal Muscle Activation & Heart Rate Reserve Attainment,

The Helix Lateral Trainer vs. The Precor EFX Elliptical Rider

Human Performance Research Lab
The University of Tampa
Lead researcher, Jacob M. Wilson, Ph.D,
Assistant Professor, Health Sciences and Human Performance

Contents:

Purpose:

The purpose of this study was to examine the effects of two competing cardiovascular training machines, the Helix Lateral Trainer and the Precor EFX Elliptical Rider, on heart rate level and skeletal muscle activation during comparable aerobic activities.

The heart rate level component of the study examined the time it took testing subjects to reach a steady heart rate reserve (HRR) of 65%.

The muscles monitored included:

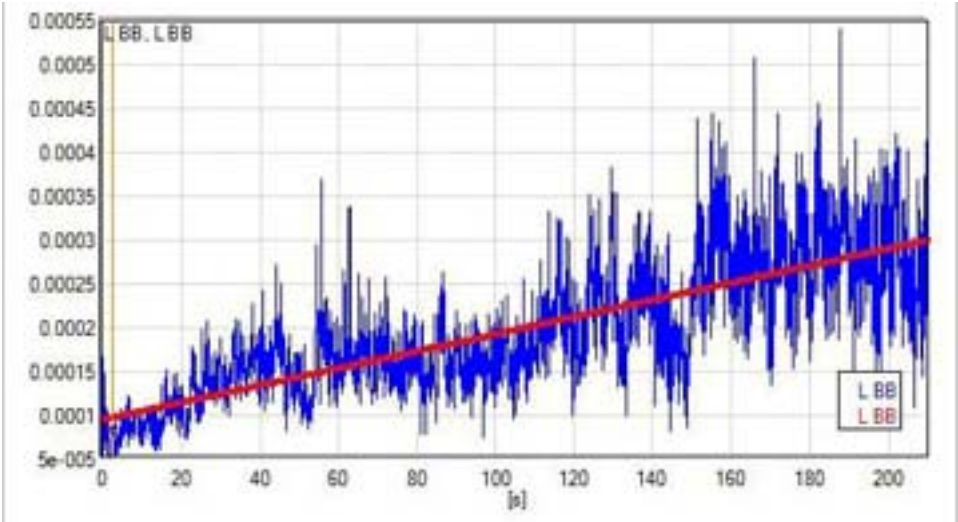
- Vastus laterals (outer thighs)
- Adductors (inner thighs)
- Gluteus maximus
- Gluteus medius
- Spinal erectors
- Rectus abdominals
- Hamstrings
- Obliques

The Laboratory:

The University of Tampa's exercise physiology laboratories are designed for studying performance, exercise metabolism and cardiovascular and muscle physiology. ??

The Human Performance Research Lab contains the latest computerized systems for the measurement of oxygen uptake, blood lactate and blood gas analyzers.

Electromyography is used to analyze skeletal muscle activation, and accelerometers are used to quantify the rate and velocity of human movement. The lab also houses the most current force plate technology and is capable of measuring power output in real time.



Our Delsys electromyography measures muscle activation during heavy weight training exercise.

Lead researcher:

Jacob M. Wilson, Ph.D

Education:

2004 California State University, B.S.
2006 California State University, M.S.
2010 Florida State Univeristy, Ph.D

Career specialties:

Dr. Wilson's specialization is on the effects of amino acids, their metabolites and resistance training on skeletal muscle tissue morphology (hypertrophy and sarcopenia), adipose tissue, strength, and function in young and aging populations.

Honors and awards:

2009 Sandals Research Fellowship, Florida State University
2008 Research and Creativity Award in the college of Human Sciences, Florida State University for The Effects of Static Stretching on Energy Cost and Endurance Performance During a 60 minute time trial
2006-2008 College of Human Sciences Doctoral Research Fellowship
2006 Attained Certified Strength and Conditioning Specialist certification, National Strength and Conditioning Association

Equipment Specifics:

The Helix 3000 Lateral Trainer by Helix
For more information, www.helixco.com

The EFX Elliptical Rider by Precor
For more information, www.precor.com

Test Subjects:

Fifteen subjects with a mean age of 20 years, and a mean body fat of 9%, participated in this study.

Methods and Materials

Primary objectives were to examine skeletal muscle activation of the outer thighs (vastus lateralis), inner thighs (adductors), gluteus maximus, gluteus medius, spinal erectors, rectus abdominals, and oblique muscles in each position discussed at a level needed to obtain 65 % of the subjects heart rate reserve. Sixty five percent of HRR was chosen as past research has demonstrated that this intensity corresponds to the greatest amount of fat calories utilized within a given training intensity

Muscle activation was measured with the delsys, wireless, trigno electromyography system.

Prior to the experiment, subjects were familiarized with both machines, including watching instructional videos.

After familiarization, subjects were then asked to randomly participate in 5 separate conditions on 5 separate occasions. Conditions 1 and 2 consisted of riding the elliptical in a neutral position and then l at maximal incline to fully engage gluteal muscles.

In conditions 3-5, subjects were asked to ride the Helix using the leg pump motion,* starting with the motion with the right leg clockwise (emphasizing an outer thigh motion), or the left leg in a counter clockwise motion (emphasizing an inner thigh motion). Subjects then were asked to adopt the squatting* motion.

* *Motions as described by the manufacturer's video*

Skeletal Muscle Activation Results

A. Precor Elliptical in full upright vs. Helix in neutral

	Precor EFX Elliptical	Helix Lateral Trainer			
Vastus Lateralus		+ 50%			
Adductors					
Gluteus Maximus					
Gluteus Medeus					
Spinal Erectors					
Rectus Abdominals					
Obliques		+ 55%			
Hamstrings	+66%				

B. Precor Elliptical in full upright vs. Helix in squat position

	Precor EFX Elliptical	Helix Lateral Trainer
Gluteus Maximus		+39%
Gluteus Medeus		+33%

Conclusion:

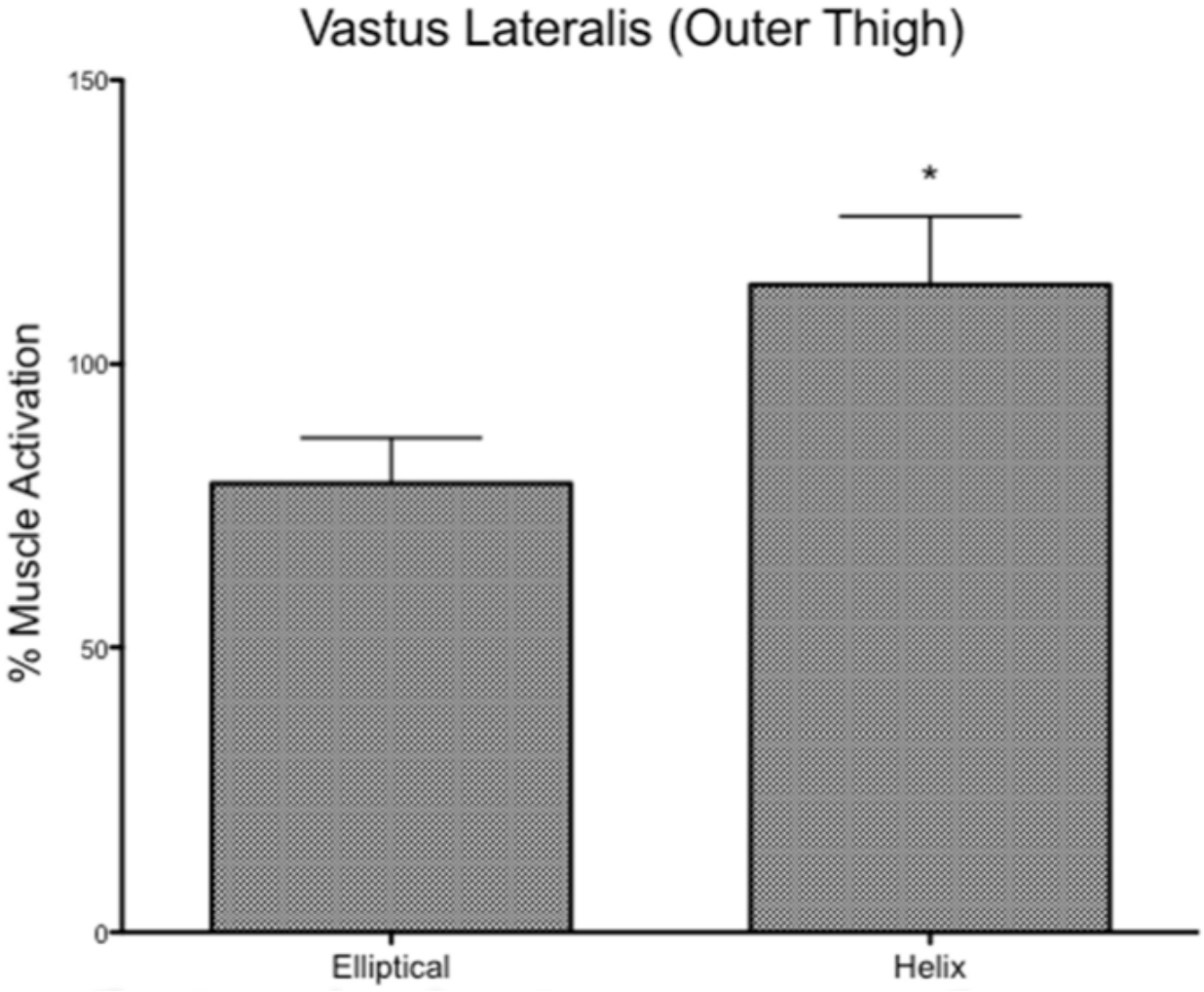
The Helix outperformed the Precor EFX Elliptical as follows:

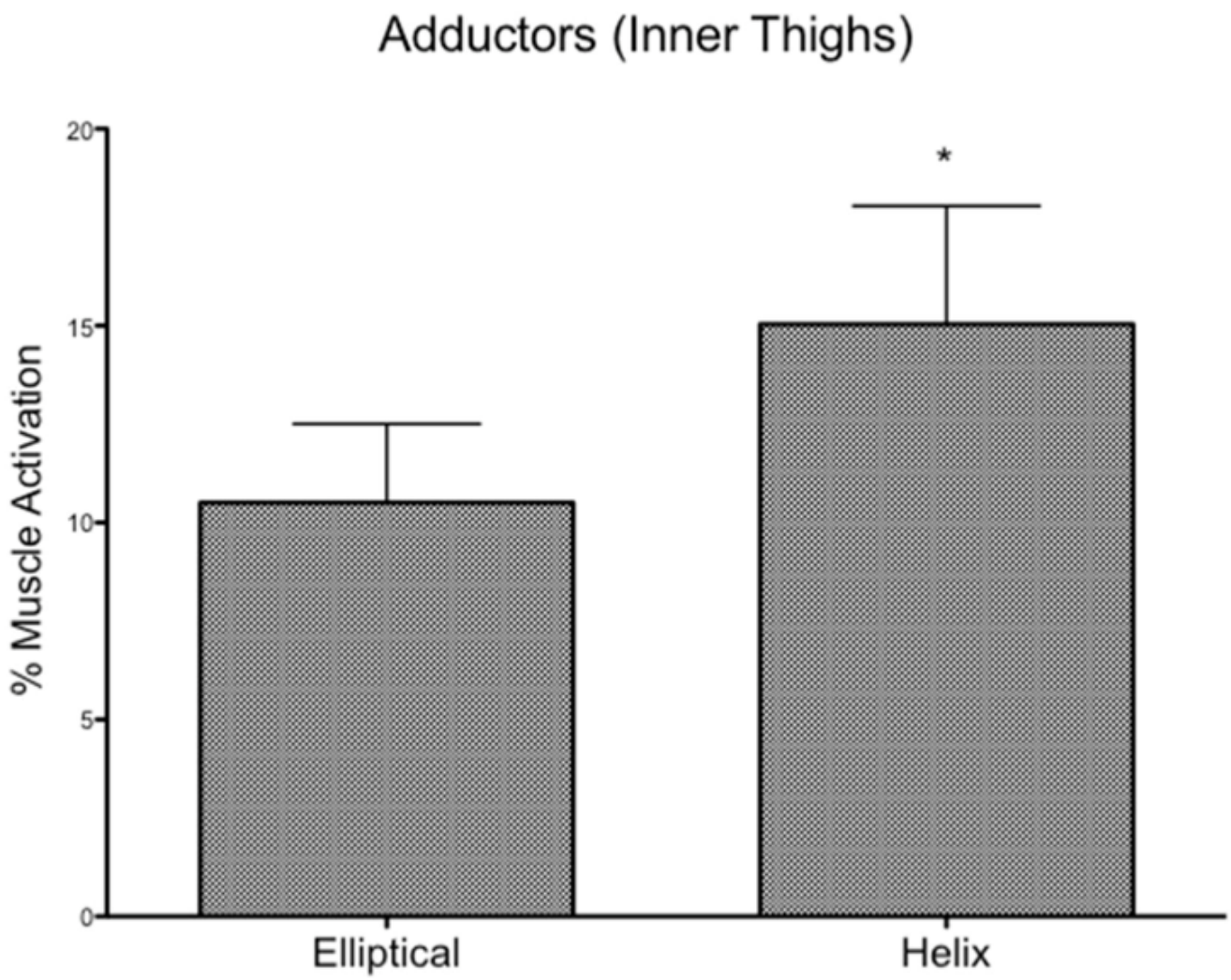
Vastus Lateralus:	+50%
Gluteus Maximus:	+39%
Gluteus Medius:	+33%
Obliques:	+55%

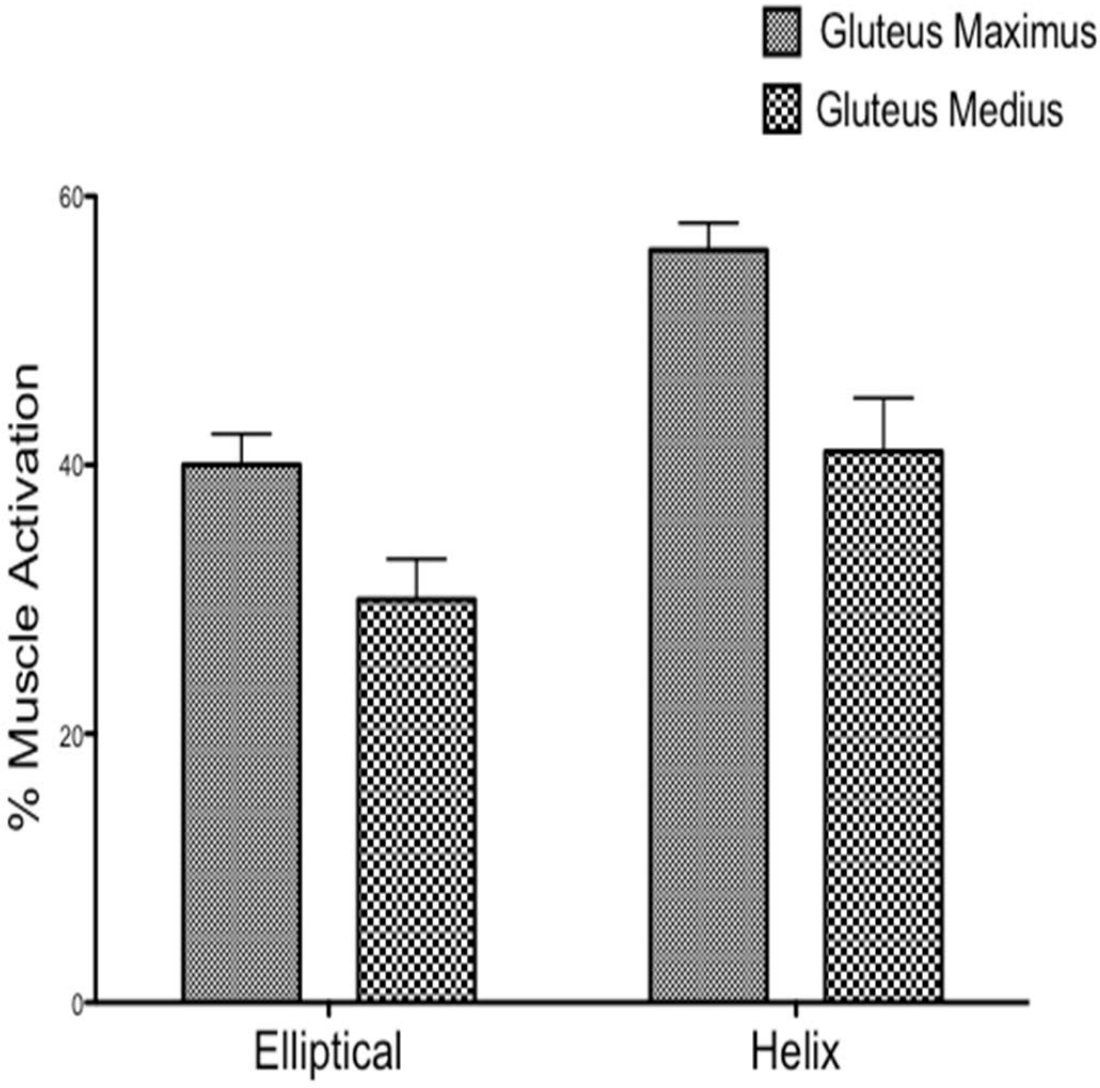
The EFX Elliptical outperformed the Helix as follows:

Hamstrings:	+66% **

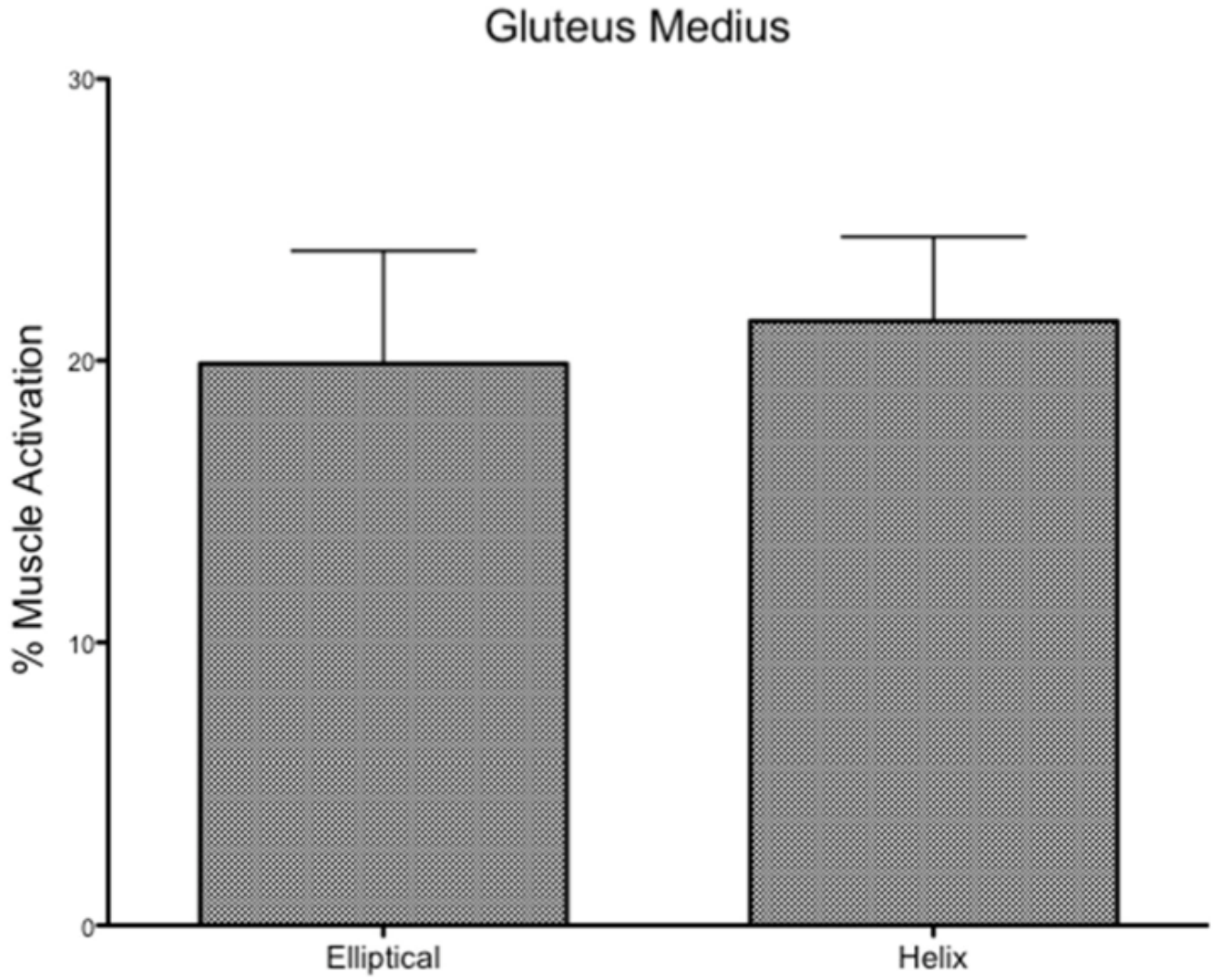
** researchers concluded that hamstrings results were due to relative lack of activity in other muscle groups for elliptical user participants; in essence, the elliptical user's hamstrings were forced to increase their performance load simply because the other lower body muscle groups were not as engaged.


Vastus Lateralis (Outer Thigh)
% Muscle Activation
150
100
50
0
*
Elliptical
Helix

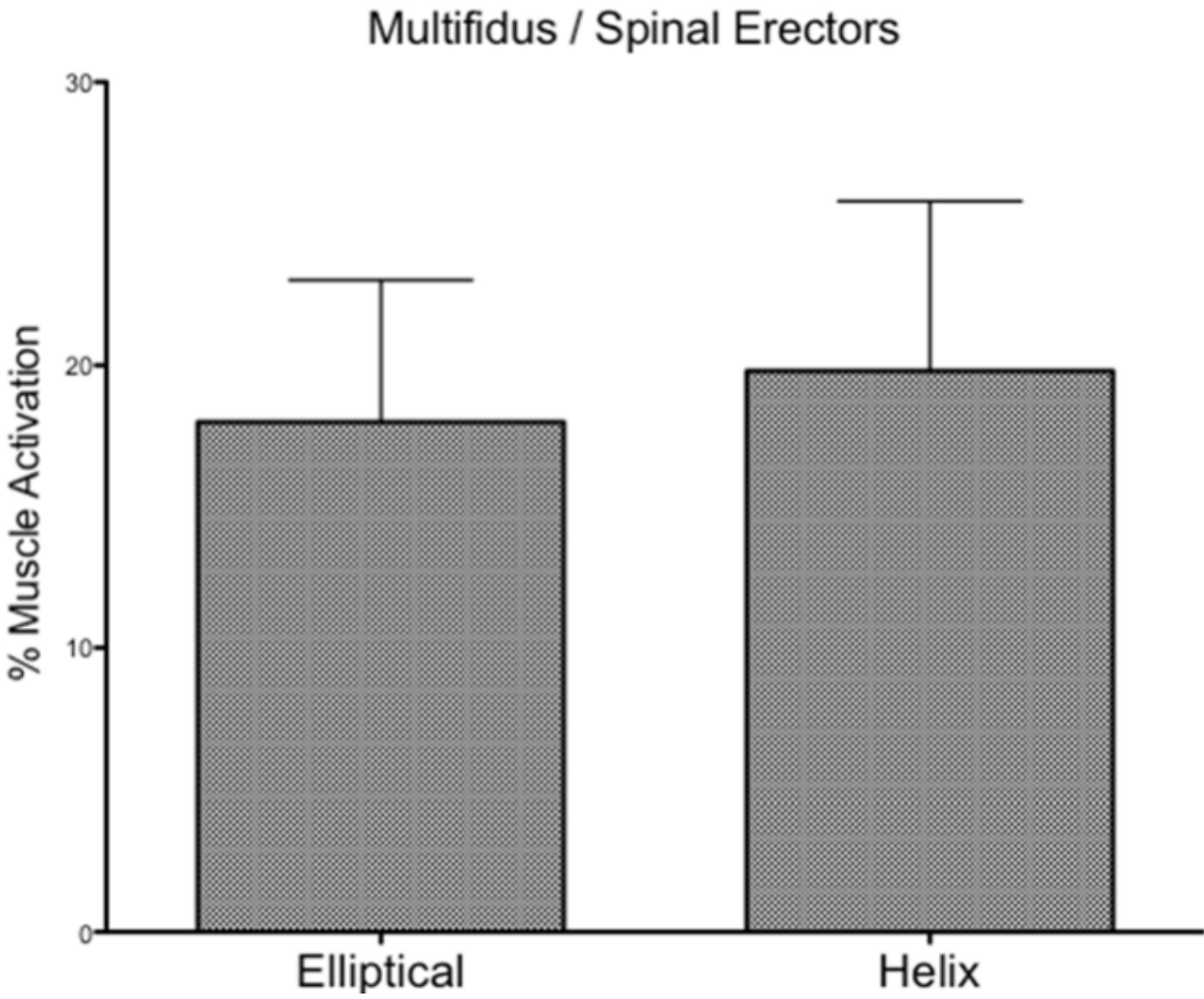

Adductors (Inner Thighs)
% Muscle Activation
20
15
10
5
0
*
Elliptical
Helix

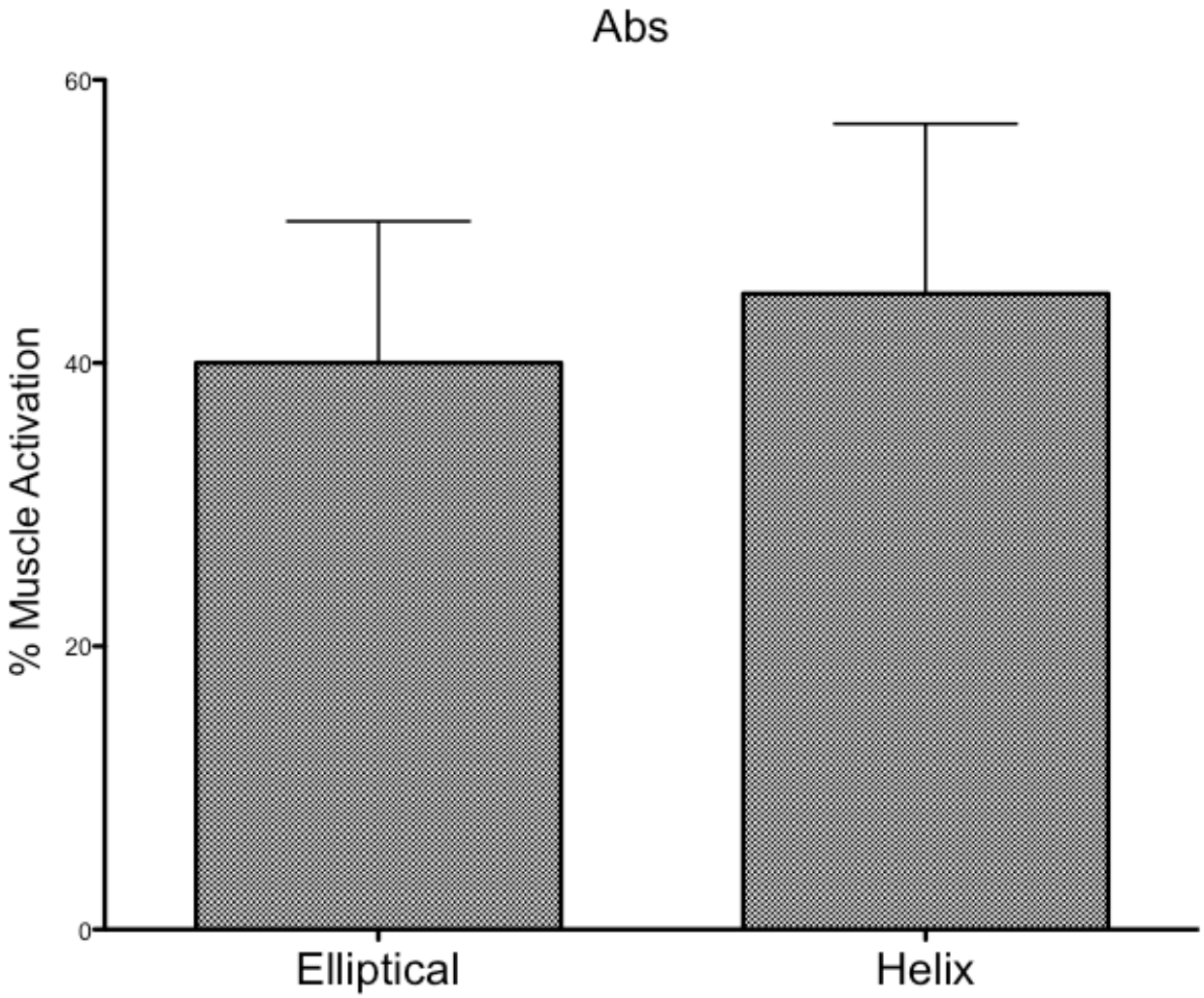


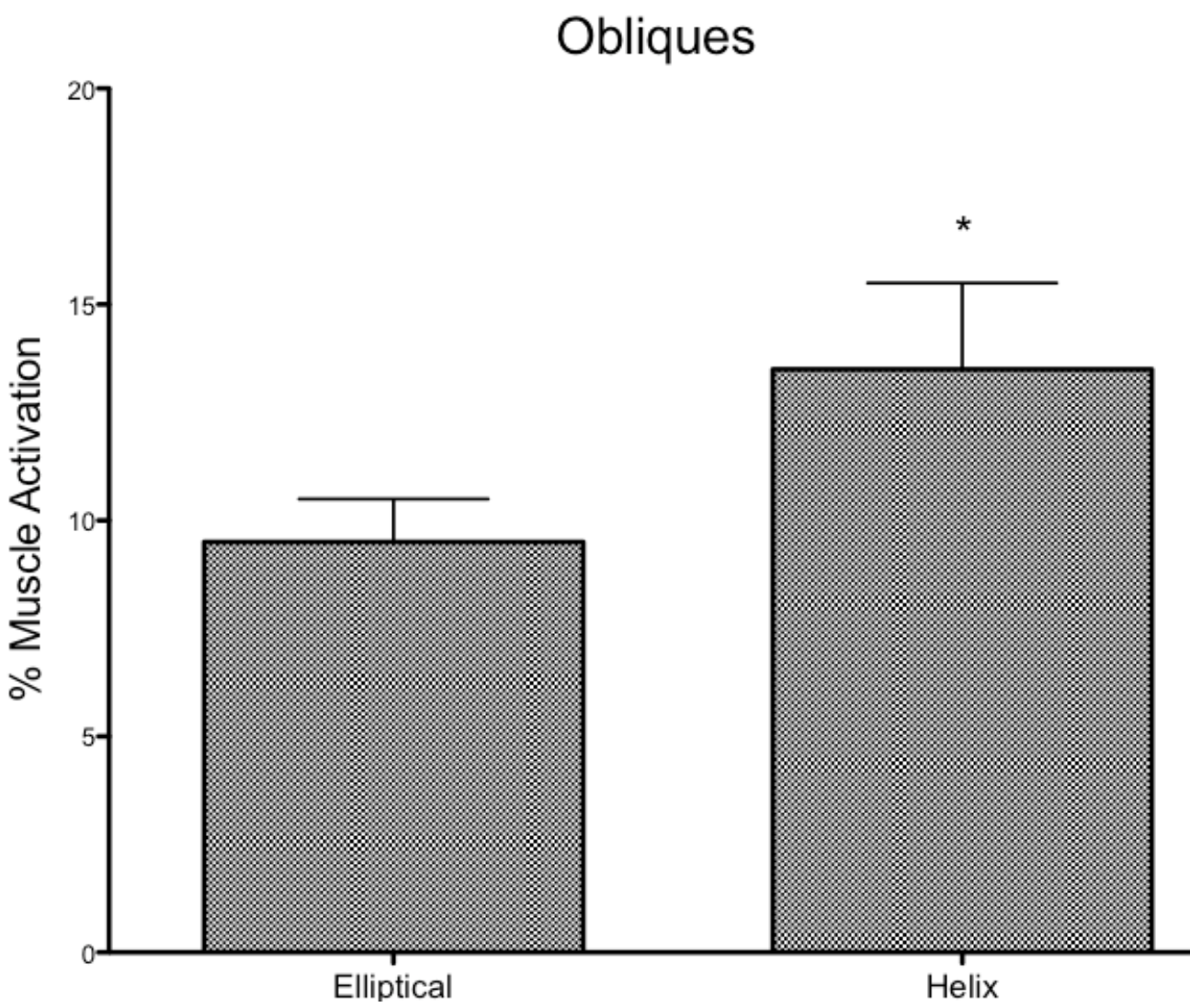
* Elliptical in full upright position vs. Helix in Squat position

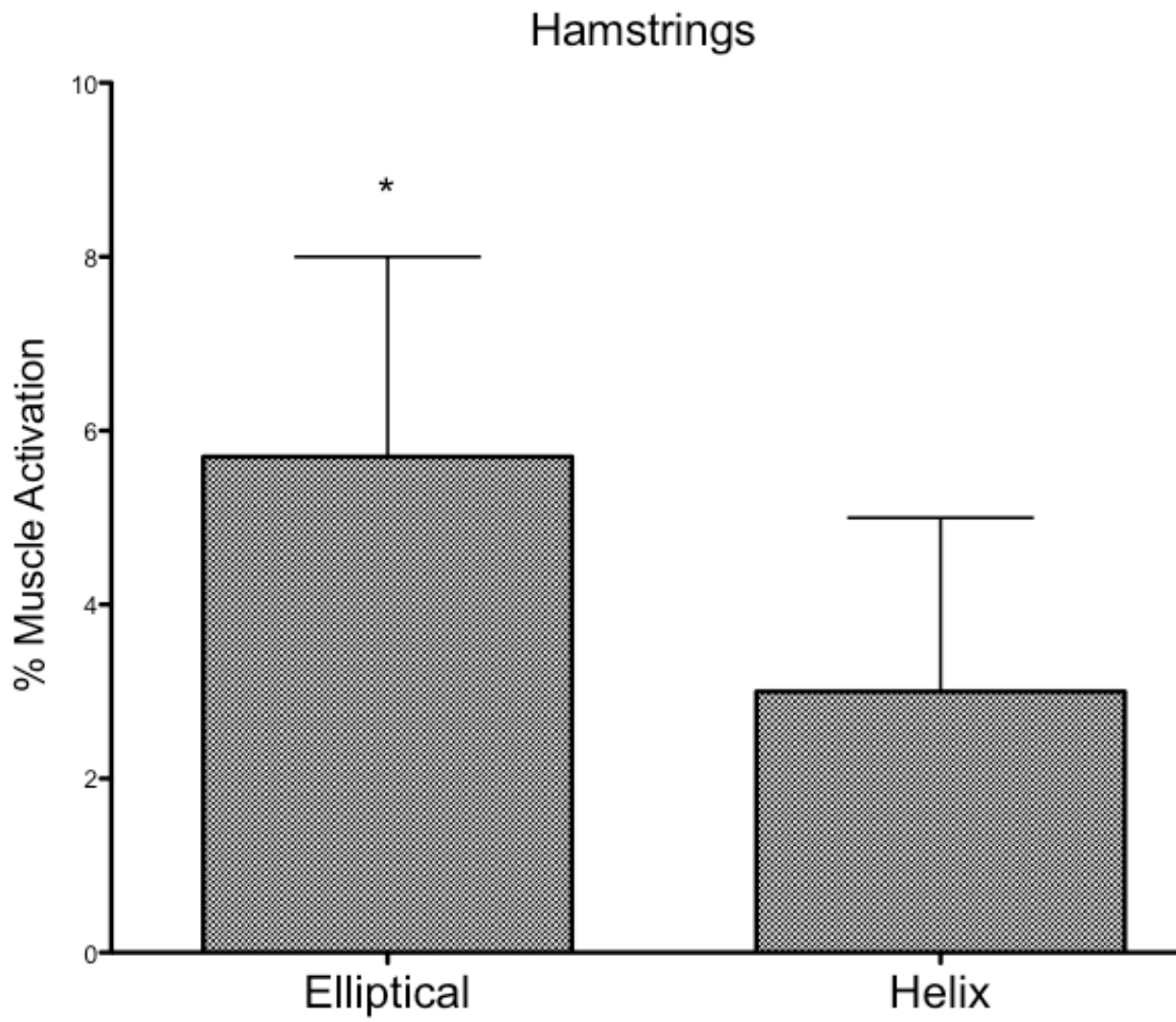


* Elliptical in full upright position versus Helix in neutral position


Multifidus / Spinal Erectors
% Muscle Activation
30
20
10
0
Elliptical
Helix


Abs
% Muscle Activation
60
40
20
0
Elliptical
Helix


Obliques
% Muscle Activation
20
15
10
5
0
*
Elliptical
Helix


Hamstrings
% Muscle Activation
10
8
6
4
2
0
*
Elliptical
Helix

Target Heart Rate Reserve (HRR) results:

Subjects were timed to achieve an HRR of 65%, an intensity which corresponds to the greatest amount of fat calories utilized within a given training intensity.

Test subjects using the Helix were able to achieve designated HRR at a rate of 23% faster than test subjects using the ellipticals.

Conclusions:

Using the latest high tech, fully wireless electromyography, research scientists at the University of Tampa explored how muscles were activated or used in both the Precor EFX Elliptical Rider and the Helix 3000 Lateral Trainer.

They compared the Elliptical Rider in a neutral position to the Helix in a neutral position and found that the Helix had superior results in 7 of 8 muscles tested.

For example, the Helix demonstrated 50% greater electrical activity (more muscle was being used) in the outer thighs, 55 % greater activity in the obliques, and 37 % more activity in the inner thighs than the elliptical.

When comparing the Helix in a squatting position with the Elliptical Rider at a full incline, researchers noted 40% more activity in the gluteus maximus and medius with the Helix.

Additionally, the study set out to measure the time research subjects took to achieve a target steady heart rate reserve (HRR) of 65%.

Results were clear; the Helix users achieved an HRR of 65%, a full 23% faster than elliptical users, translating to more time spent expending fat calories in equivalently timed workouts.