Resistance Training Modulation of Fat Metabolism in Postmenopausal Women with Obesity

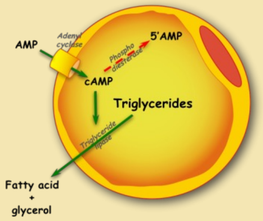
Fiona Dininger, Patrick Demarco, Mike Bellavance, Kasper Buchen, and Mostafa Ali

Florida State University, College of Health and Human Sciences

Introduction

- Prediabetes, a comorbidity of obesity, affects more than one-half of women over 60 years of age, and is a precursor of many disease
- It is believed that obese individuals have a reduced response to both lipolytic and antilipolytic stimuli.
- The flexibility to adapt both basal lipolysis as well as the response to lipolytic and antilipolytic stimuli has been presented as a determinant of future weight gain, impaired glucose control, and eventually type 2 diabetes

- Lipolysis is the process of breaking down lipids. It entails hydrolysis as it breaks down a triglyceride into a fatty acid and a glycerol.



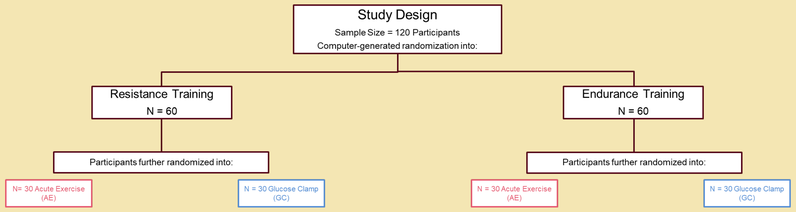
- It is known that endurance exercises improving cardiovascular endurance can help reduce the risk for these diseases, however, other exercise types have not been investigated.
- The increased plasma concentration of epinephrine, which activates betareceptors in adipocytes, is regarded to be the main component stimulating adipose tissue lipolysis during exercise.

Abstract

- Participants will undergo 12 weeks of either resistance or endurance training and both their regional lipolytic activity and whole-body fat metabolism will be assessed before and after the exercise training.
- Our study hopes to yield results that will have implications on improving health guidelines to prevent diabetes and other metabolism related disorders in postmenopausal women.
- Our hypothesis is that both resistance and endurance training will have positive impacts on fat metabolism by increasing lipolytic flexibility.

Methods

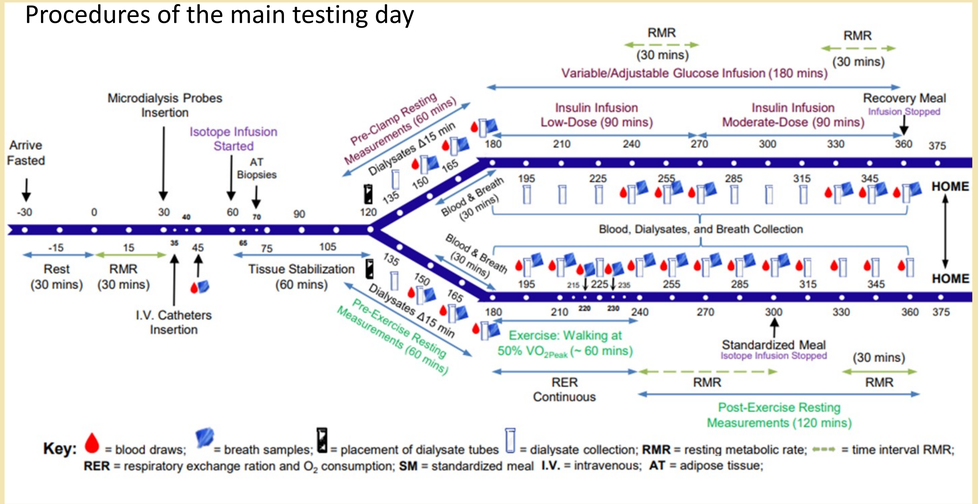
- 120 participants were chosen to reinforce statistical significance within the differences in lipolytic activity and other variables.
- For testing, each group was further subdivided into either acute exercise or glucose clamp testing each of which is combined with microdialysis procedures in the subcutaneous adipose tissue.



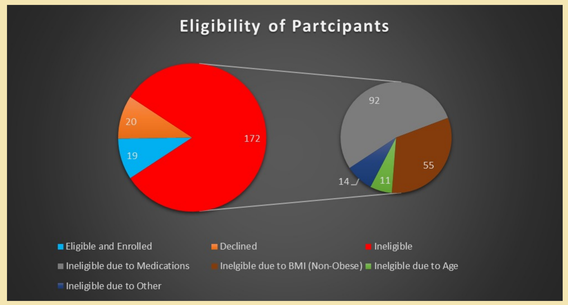
- For the main testing procedure, each participant underwent microdialysis, a technique where an ethanol-water mixture is perfused into probes inserted into fat deposits in the glutes and abdominals.
- The probes collected dialysate (fluid) samples, which give data on the participant's regional lipolytic activity.

Methods Continued

Procedures of the main testing day



Results



- Inclusion Criteria: Age: 50-70, postmenopausal at least 2 years, BMI: 30-39.9 kg/m², prediabetes, sedentary, stable body weight
- Exclusion Criteria: Blood pressure above 140/90 mmHg, type 1 or 2 diabetes, use of tobacco, medications affecting lipid metabolism, and eating disorders

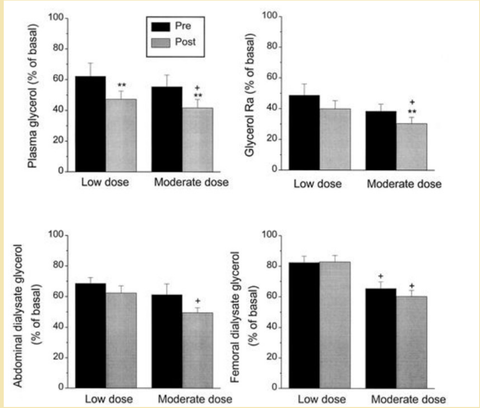
Characteristics of study participants

	Endurance (N = 8)		Resistance (N = 11)	
	Insulin Clamp (N = 5)	Acute Ex. (N = 3)	Insulin Clamp (N = 5)	Acute Ex. (N = 6)
Age (yrs.)	58.80 ± 2.10	56.67 ± 4.10	60.20 ± 2.22	59.67 ± 2.70
Height (cm)	160.0 ± 4.02	164.7 ± 1.53	166.6 ± 3.27	166.6 ± 2.33
Weight (kg)	87.22 ± 4.37	92.97 ± 2.33	97.14 ± 4.28	97.88 ± 3.59
BMI (kg/m²)	34.14 ± 1.45	34.26 ± 0.47	35.11 ± 1.93	35.40 ± 1.70
FBG (mg/dL)	111.5 ± 2.53	97.33 ± 4.91	106.0 ± 3.21	94.00 ± 4.27
HbA1c (%)	5.650 ± 0.10	5.700 ± 0.06	5.920 ± 0.28	5.860 ± 0.08
2-hr OGTT (mg/dL)	150.3 ± 11.76	139.0 ± 2.52	139.8 ± 19.54	145.0 ± 13.90
WHR	0.8650 ± 0.02	0.8733 ± 0.02	0.7920 ± 0.04	0.8620 ± 0.04

- Data are shown as means ± SEM
- BMI= Body Mass Index
- FGB= Fasting Blood Glucose
- HbA1c= Amount of blood sugar (glucose) attached to hemoglobin (oxygen carrier)
- OGTT= Glucose tolerance test, measures response to glucose
- WHR= Waist-to-hip ratio

Conclusions

- As our project is still in the experimental data collection stage, final results have not been determined
- However, preliminary data demonstrates that acute resistance exercise increases lipolysis in non-obese women.
- Additionally, it is known that endurance training increases lipolytic flexibility as per results of existing research.
- These studies inform our hypothesis that both endurance and resistance training will increase lipolytic flexibility.



- Plasma glycerol, glycerol Ra, and dialysate glycerol from microdialysis probes placed in abdominal and femoral sc adipose tissue before (▪) and after (weeks of endurance training during a low dose (10 mU/m2·min) and moderate dose (20 mU/m2·min) insulin infusion.

References

- Hickner, R. C., Racette, S. B., Binder, E. F., Fisher, J. S., & Kohrt, W. M. (2000). Effects of 10 days of endurance exercise training on the suppression of whole body and regional lipolysis by insulin. *The Journal of clinical endocrinology and metabolism*, *85*(4), 1498–1504. https://doi.org/10.1210/jcem.85.4.6550
- Sial, S., Coggan, A. R., Hickner, R. C., & Klein, S. (1998). Training-induced alterations in fat and carbohydrate metabolism during exercise in elderly subjects. The American journal of physiology, 274(5), E785–E790. https://doi.org/10.1152/ajpendo.1998.274.5.E785

Acknowledgements

We would like to thank Dr. Mostafa Ali, Dr. Robert Hickner, Dr. Holly Clarke, Paul Baker, and Cesar Mesa for their unending support and amazing mentorship!

RESEARCH POSTER PRESENTATION DESIGN © 2015
www.PosterPresentations.com