

UNIVERSITY OF NORTH CAROLINA *at* CHAPEL HILL



• **Exercise Physiology** •



uncexss.wordpress.com

[uncexss](https://www.facebook.com/uncexss)

[@uncexss](https://twitter.com/uncexss)



Departmental Mission

“The mission of the Department of EXSS is to discover, create and promote knowledge of human movement to improve the quality of life of individuals and society. “



Exercise Physiology Graduate Programs

Master's of Arts

Course of Study

- Minimum of 30 hours of coursework (24 required courses & 6 hours of electives).

Written Comprehensive Examination

- Taken after the first year of completed course work.

Research-Driven Thesis

- Thesis topics are determined under the guidance of your advisor.

Assistantships

- Competitive teaching assistantships are available that often include tuition remission, health insurance, and a stipend.

Doctoral Program

Human Movement Science Curriculum

- Interdisciplinary Program in Allied Health Sciences
- Mentor based, research-intensive program

Assistantships

- Research and teaching assistantships are available, dependent upon faculty funding



Claudio Battaglini, Ph.D., FACSM, Professor



Positions:

- Co-Director of the Exercise Oncology Research Lab
- Director of the Get Real and Heel After Care Breast Cancer Research Program
- Coordinator of the Exercise Physiology Graduate Specialization

Research Interests:

Clinical Exercise Physiology (Oncology, Schizophrenia); Sports Performance (Triathlon, Marathon, and Swimming Training Methods), and Dynamical Models for the prediction of physiological responses during exercise.

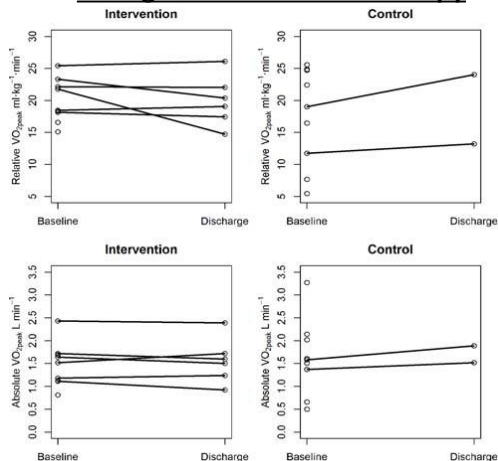
Recent Publications:

- Coffman EM, Bryant AL, Deal AM, Wang Y, Hanson ED, Phillips Foster M, Wood WA, Bailey C, Muss H, **Battaglini C.L.** Feasibility and Safety of Cardiopulmonary Exercise Testing in Acute Leukemia Patients during Induction Chemotherapy. *Ann Hematol Oncol.* 2018; 5(1): 1188.
- Theresa Coles, T., Bennett, A., Tan, X., **Battaglini, C.L.**, Sanoff, H., Basch, E., Jensen, R., Reeve, B. Relationship between sleep and exercise as colorectal cancer survivors transition off treatment, *Supportive Care in Cancer.* 2018 Aug;26(8):2663-2673. doi: 10.1007/s00520-018-4110-8. Epub 2018 Feb 22.
- Mazzoleni, M., **Battaglini, C.L.**, Martin, K., Coffman, E., Ekaidat, J., Wood, W., Mann, B. Predicting Maximal Heart Rate and Maximum Oxygen Uptake From a Submaximal Cycle Ergometer Test Using a Dynamical System Model and Heuristic Parameter Estimation Algorithm. *Sports Eng* 2017 Jul 15: DOI 10.1007/s12283-017-0242-1 [Epub ahead of print]
- Browne, J., **Battaglini, C.L.**, Penn, D. Workout by Walking (WOW): A pilot Exercise Program for Individuals with Schizophrenia Spectrum Disorders. *J Nerv Ment Dis.* 2016 Jul 5. [Epub ahead of print]
- Berry, N., Wildeman, L., Shields, E., and **Battaglini, C.L.** The Effects of a 10Km Run and 30Km Cycling Time-Trial on Ventilatory Threshold during the Final Leg of an ITU Duathlon Simulation in the Laboratory in Highly-trained Multi-Sport Athletes. *J Sport Sci & Med.* 2016 May 23;15(2):247-53

Recent Graduate Student Projects under Dr. Battaglini

Clinical Exercise Physiology (Oncology, Schizophrenia)

Feasibility and Safety of Cardiopulmonary Exercise Testing in Acute Leukemia Patients during Induction Chemotherapy

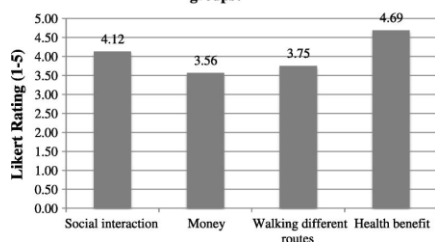


Baseline and Discharge $\dot{V}O_{2peak}$ values expressed in relative (mL.kg⁻¹.min⁻¹) and Absolute (L.min⁻¹) at baseline and at discharge.

Source: Coffman et al. *Ann. Hematol. Oncol.* 2018.

Workout by Walking (WOW): A pilot Exercise Program for Individuals with Schizophrenia Spectrum Disorders

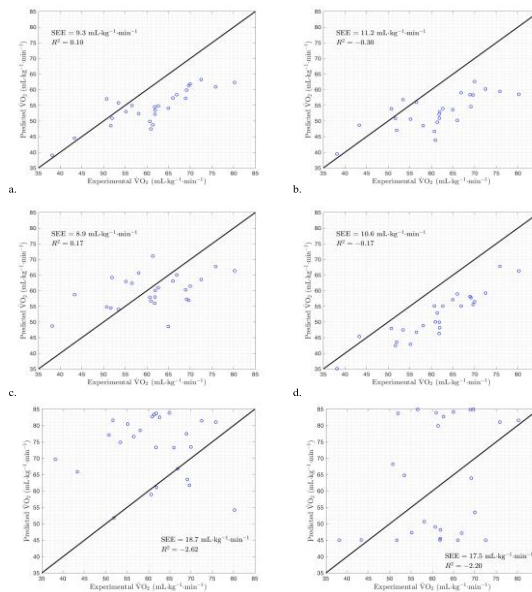
How much did each of the following motivate you to attend groups?



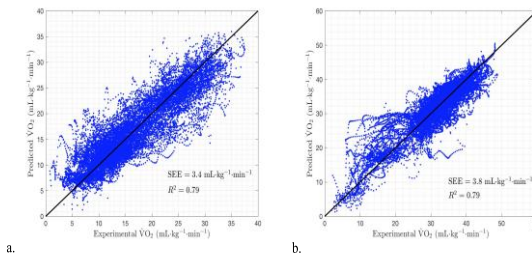
Source: Browne et al. *J Nerv Ment Dis.* 2016 Jul 5 [Epub ahead of print]

Dynamical Systems Models

A Mathematical Model for Predicting Maximal Heart Rate, Maximal Oxygen Uptake, and Oxygen Kinetics During Walking and Running at Varied Intensities



Line of identity plots comparing the $\dot{V}O_2$ max predictions to the experimental values for the (a) George equation, (b) Jackson equation, (c) Ebbeling single-stage test, (d) Bruce equation, (e) DSM-GA: Walk estimation, and (f) DSM-GA: Run estimation.

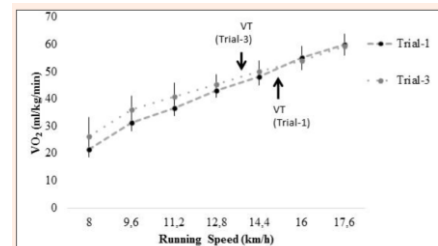


Figures a and b provide an example time series plot for one subject's $\dot{V}O_2$ prediction for (a) walking and (b) running.

Source: Andrew Borrer et al. Manuscript in preparation

Sports Performance

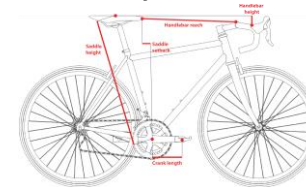
The Effects of a 10Km Run and 30Km Cycling Time-Trial on Ventilatory Threshold during the Final Leg of an ITU Duathlon Simulation in the Laboratory in Highly-trained Multi-Sport Athletes.



Running economy, expressed as a comparison of $\dot{V}O_2$ at each submaximal running speed during the incremental treadmill tests performed during Trial-1 and Trial-3. Arrows indicate the calculated ventilatory threshold for Trial-1 and Trial-3 respectively.

Source: Berry et al. *J Sport Sci & Med.* 2016 May 23;15(2):247-53

The Effect of Bicycle Crank Length on Maximal Oxygen Uptake and Ventilatory Threshold in Trained Cyclists



The purpose of this study is to determine the influence of crank length on maximal oxygen uptake ($\dot{V}O_{2max}$) and ventilatory threshold (VT) in trained cyclists and multisport athletes. Additionally, exploratory analysis will investigate whether differences in $\dot{V}O_{2max}$ and/or VT across crank lengths (if any) can be explained by the athlete's vertical leap, leg length, preferred cadence, lower body lean mass, and/or submaximal cycling economy.

Source: Stephanie Sullivan et al. Project underway

Anthony C. Hackney, Ph.D., D.Sc. *FACSM, FNAK*

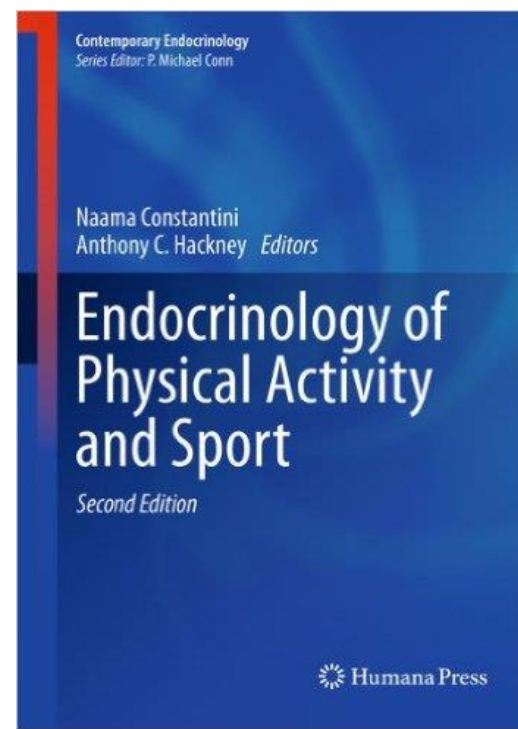
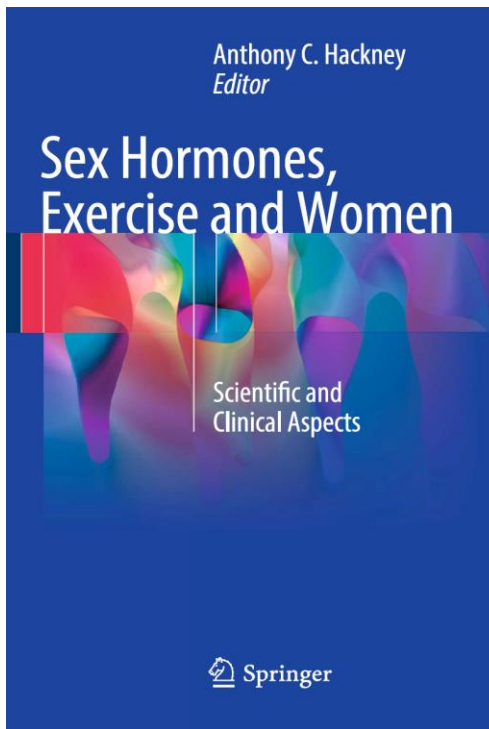
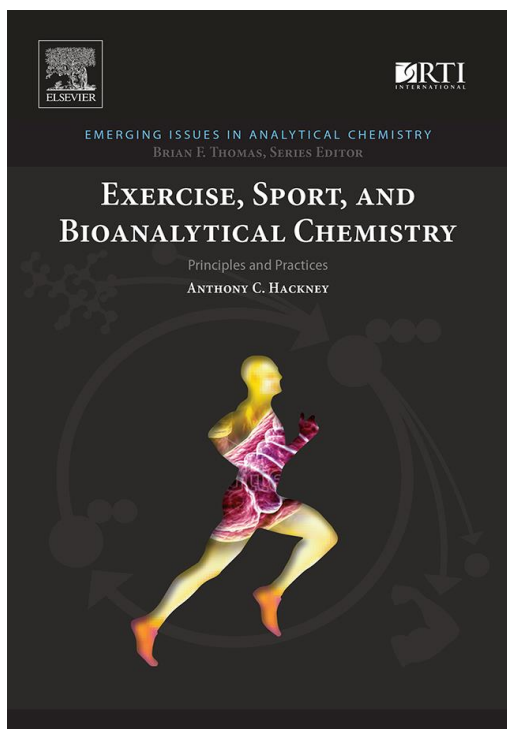


Position: Professor Exercise Physiology & Nutrition

Research Interests: Exercise Endocrinology & Biochemistry; Stress Physiology

Recent Publication: Anderson T, AR Lane & AC Hackney. Cortisol and testosterone dynamics following exhaustive endurance exercise. *Eur J Appl Physiol.* 2016 Aug;116(8):1503-9.

Books



Graduate Student Projects @ SEACSM Under Dr. Hackney



P22

RELATIONSHIP BETWEEN MARATHONS COMPLETED AND LIBIDO IN ENDURANCE-TRAINED MALES

G.H. Zieff, A.R. Lane, J.K. Register-Mihalik, C.B. O'Leary and A.C. Hackney FACSM.
Department of Exercise and Sport Science, University of North Carolina Chapel Hill, Chapel Hill, NC

**8:00-9:00
T8**

TUTORIAL SESSION VIII (Ballroom G) LOW TESTOSTERONE IN EXERCISING MEN: A FIRST HAND ACCOUNT, HISTORIC OVERVIEW, AND IDEAS FOR FUTURE RESEARCH

D.R. Hooper, M. Bach, A.C. Hackney FACSM, Department of Health Sciences, Armstrong State University, Savannah, GA; UNC, Chapel Hill, NC
Chair: JohnEric Smith, Ph.D., Mississippi State University

P126

BODY MASS INDEX IS ASSOCIATED WITH CARTILAGE TURNOVER IN INDIVIDUALS WITH ACL RECONSTRUCTION

AR Lane, MS Harkey, BA Luc-Harkey, HC Davis, JT Blackburn, AC Hackney FACSM, B Pietrosimone. University of North Carolina, Chapel Hill, NC

Erik Hanson, Ph.D., CSCS, Assistant Professor and Kulynych/Story Fellow



Positions:

- Co-Director of the Exercise Oncology Research Lab

Research Interests:

Exercise Immunology, Exercise Oncology, Biochemistry, Muscle Physiology and Function

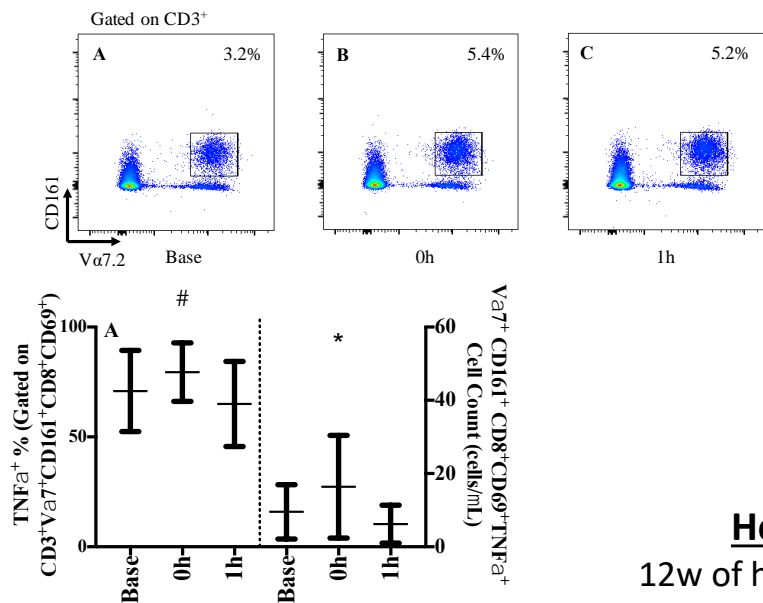
Recent Publications:

- **Hanson E.D.**, Sakkal S., Evans W.E., Violet J.A., Battaglini C.L., McConell G.K, and A. Hayes. Altered Stress Hormone Response Following Acute Exercise During Prostate Cancer Treatment. *Scandinavian Journal of Medicine and Science in Sports*. 28(8): 1925-1933, 2018.
- Lamboley C.R., Xu H., Dutka T.L., **Hanson E.D.**, Hayes A., Violet J.A., Murphy R.M., and G.D. Lamb. Effect of Androgen Deprivation Therapy on the Contractile Properties of Type I and Type II skeletal Muscle Fibers in Men with Non-Metastatic Prostate Cancer. *Clinical and Experimental Pharmacology and Physiology*. 45(2): 146-154, 2018
- **Hanson E.D.**, Danson E., Blyth C., Nguyen-Robertson C.V., Fyfe J.J., Stepto N.K., and S. Sakkal. Maximal Exercise Increases Mucosal Associated Invariant T Cell Frequency and Number in Healthy Young Men. *European Journal of Applied Physiology*. 117(11): 2159-2169, 2017.
- **Hanson E.D.**, Nelson A.R., West D.W.D., Violet J., O'Keefe L., Phillips S.M., and A. Hayes. Attenuation of Resting but Not Load-Mediated Protein Synthesis in Prostate Cancer Patients during Androgen Deprivation. *Journal of Clinical Endocrinology and Metabolism*, 120(3): 1076-2083, 2017.
- **Hanson E.D.**, Wagoner C., Anderson T., and C.L. Battaglini. The Independent Effects of Strength Training in Cancer Survivors: A Systematic Review. *Current Oncology Reports*. 18(5):31, 2016

Recent Graduate Student Projects under Dr. Hanson

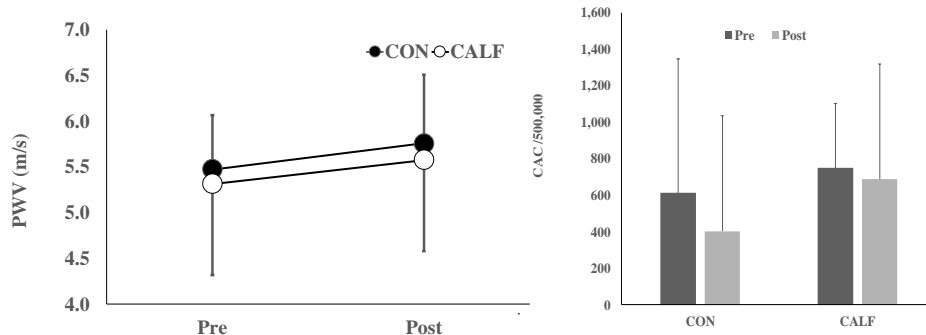
MAIT Cells & SubMax Exercise

MAIT cell proportions remain elevated after exercise and cytokine secretion is higher, indicating greater cellular function.



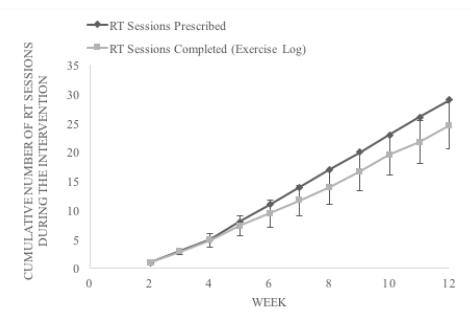
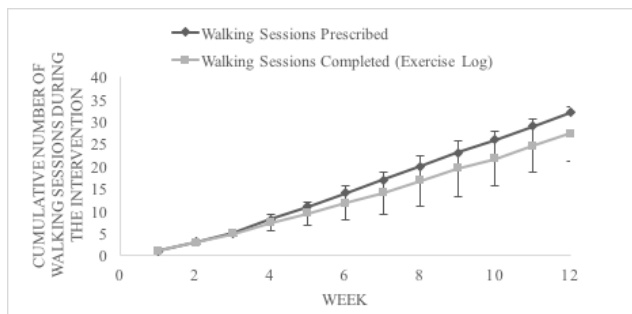
Sitting and Circulating Angiogenic Cells

3h of sitting increases arterial stiffness but does not alter CAC numbers or gene expression.



Home-Based Exercise in Metastatic Prostate Cancer

12w of home-based exercise appears feasible in this population, with ~70 of men completing the intervention with high levels of adherence.



Kristin Ondrak, Ph.D., ACSM RCEP, Adjunct Lecturer



Courses Taught:

- Human Physiology, Exercise Physiology, Sports Nutrition, Anatomy, Exercise Testing and Prescription, Pediatric Exercise Physiology

Research Interests:

Pediatric obesity, diabetes and physical activity

Recent Publications:

Hirsh, KR, Smith-Ryan AE, Blue, MN, Mock MG, Trexler, ET, and **Ondrak, KS.** (2016). Metabolic characterization of overweight and obese adults. *The Physician and Sportsmedicine.*

KS Ondrak and RG McMurray (May 2016). Comparison of Energy Expenditure of Youth Playing Tennis during Practice and Match Settings. *Journal of Physical Activity and Health.*

KS Ondrak. Energy balance and weight control (male and female): considerations. In *Endocrinology of Physical Activity and Sport.* Humana Press, 2013, pg 175-185.

McMurray RG and **Ondrak KS.** (18 Mar 2013). Cardiometabolic Risk Factors in Children: The Importance of Physical Activity. *American Journal of Lifestyle Medicine.*

Eric D. Ryan, Ph.D., FNCSA, CSCS*D, Associate Professor and Stallings Fellow



Positions:

- Co-Director of the Neuromuscular Research Laboratory
- Director of the Exercise Science Teaching Laboratory

Research Interests:

The influence of *acute* (i.e. passive stretching, vibration, fatigue, eccentric exercise) and *chronic* (i.e. aging, occupational demands, training, nutritional supplementation) stressors on neuromuscular function.

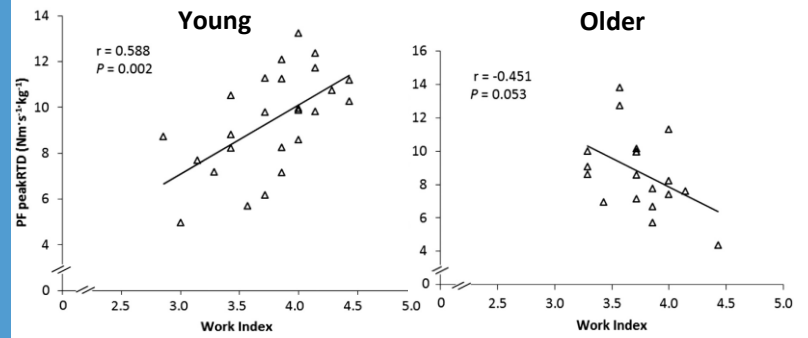
Recent Publications:

- Sobolewski, E.J., B.J. Thompson, E.C. Conchola, and E.D. Ryan. **Development and examination of a functional reactive agility test for older adults**. Aging Clin Exp Res. (2018).
- Hirsch, K.R., A.J. Tweedell, C.R. Kleinberg, G.R. Gerstner, T.J. Barnette, J.A. Mota, A.E. Smith-Ryan, E.D. Ryan. **The influence of habitual protein intake on body composition and muscular strength in career firefighters**. J Am Coll Nutr. (2018).
- Gerstner, G.R., B.J. Thompson, J.G. Rosenberg, E.J. Sobolewski, M.J. Scharville, and E.D. Ryan. **Neural and muscular factors contributing to the age-related reductions in rapid strength**. Med Sci Sport Exerc. (2017).
- Ryan, E.D., B.J. Thompson, and E.J. Sobolewski. **The influence of manual labor at work on muscular fitness and its relationship with work performance**. J Occup Environ Med. (2016)
- Kleinberg, C.R., E.D. Ryan, A.J. Tweedell, T.J. Barnette, and C.W. Wagoner. **The Influence of Lower Extremity Muscle Size and Quality on Stair-Climb Performance in Career Firefighters**. J Strength Cond Res. (2016)

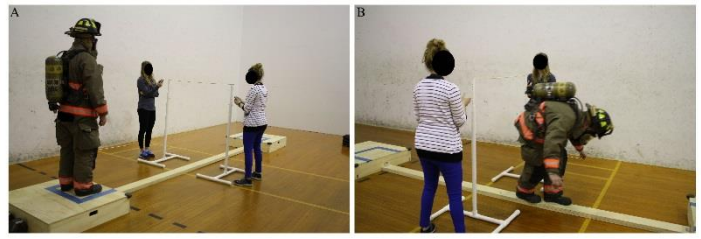
Recent Graduate Student Projects under Dr. Ryan

Occupational Health & Performance

A high workload is related to greater rapid strength in young blue collar workers, but a lower rapid strength in older blue collar workers **Source:** Thompson et al. *Appl Ergon.* 2015



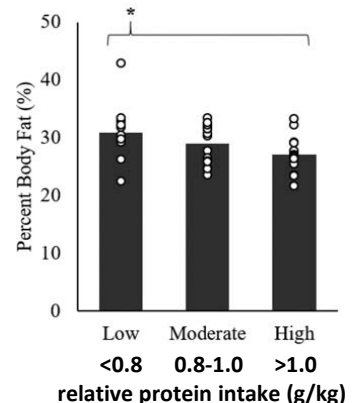
Leg strength at 100 ms, age, and %BF explains 42 – 50% of the variance in functional balance performance in firefighters.



Source: Mota et al. *Sci Reports.* In review.

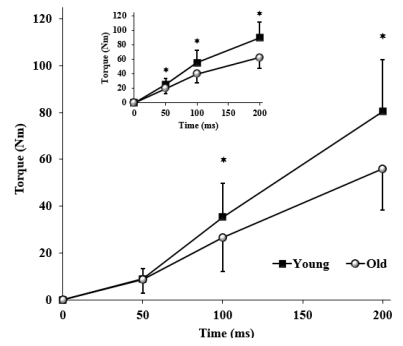
Greater relative protein intake (g/kg) was associated with less fat mass, %BF, and greater % lean mass in career firefighters.

Source: Hirsch et al. *J Am Coll Nutr.* 2018

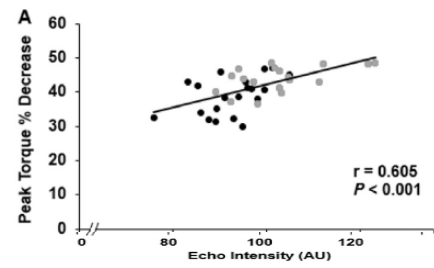
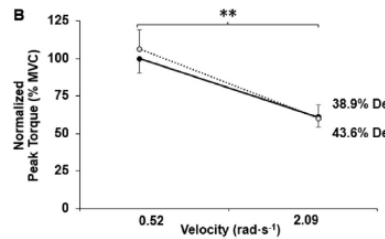


Age-related Neuromuscular Function

Rapid strength ↓ with age at late time intervals (≥ 100 ms) due to alterations in muscle quality, architecture, and activation

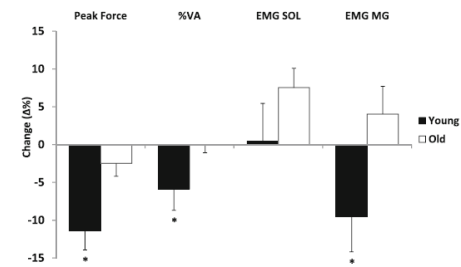


Age-related reductions in muscle quality influences the relative differences in strength and power **Source:** Gerstner et al. *Exp Gerontol.* 2017



Older men do not experience stretching-induced impairments in strength and activation like young adults. Older adults also appear to have ↑ increases in ROM following an acute bout of stretching.

Source: Ryan et al. *Age.* 2014



Abbie E. Smith-Ryan, Ph.D. CSCS*D, FACSM, FNSCA, FISSN, Associate Professor



Positions:

- Director of the Applied Physiology Laboratory
- Co-Director of the Human Performance Center

Research Interests:

Exercise and nutrition interventions to modify various aspects of body composition, cardiovascular health, and metabolic function in athletes and clinical populations.

Selected Recent Publications:

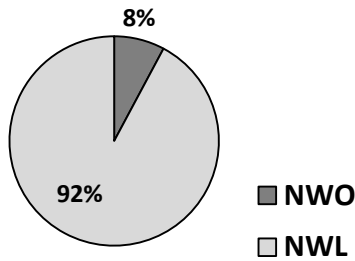
- Malia N. Blue*, Eric T. Trexler, Katie R. Hirsch, Abbie E. Smith-Ryan. **A profile of body composition, omega-3, and vitamin D in a subset of National Football League Players.** *J Sports Medicine and Physical Fitness*. 2018 Mar 1. [Epub ahead of print].
- Meredith G. Mock*, Katie R. Hirsch, Malia N.M. Blue, Erica J. Roelofs, Eric T. Trexler, Abbie E. Smith-Ryan. **Post exercise ingestion of a high molecular weight glucose polymer solution does not improve cycle performance in female athletes.** *J Strength Cond Res*. 2018 Feb 27. [Epub head of print].
- Katie R. Hirsch*, Andrew J. Tweedell, Craig R. Kleinberg, Gena R. Gerstner, T.J. Barnett, Jacob A. Mota, Abbie E. Smith-Ryan, Eric D. Ryan. **Habitual protein intake: the relationship with body composition and muscular strength in career firefighters.** *J Am Coll Nutr*. 2018 Apr 27:1-7.
- Malia N.M. Blue*, Katie R. Hirsch, Eric T. Trexler, Abbie E. Smith-Ryan. **Validity of the 4-compartment model using dual energy X-ray absorptiometry derived body volume in overweight individuals.** *App Phys Nutr Metab*. 2018 Feb 23. [Epub ahead of print].
- Eric T. Trexler*, Abbie E. Smith-Ryan, J.D. Defreese, Stephen W. Marshall, Kevin M. Gusckiewicz, Zachary Y. Kerr. **Body mass index increase after retirement is associate with cardiometabolic disease prevalence in former professional football players.** *Med Sci Sport Exer*. 2018 Apr;50(4):684-690.



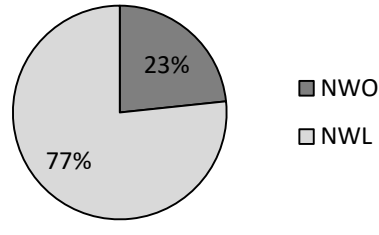
Recent Graduate Student Projects under Dr. Smith-Ryan

Normal Weight Obesity

Females: NHANES 50th Percentile



Males: NHANES 50th Percentile

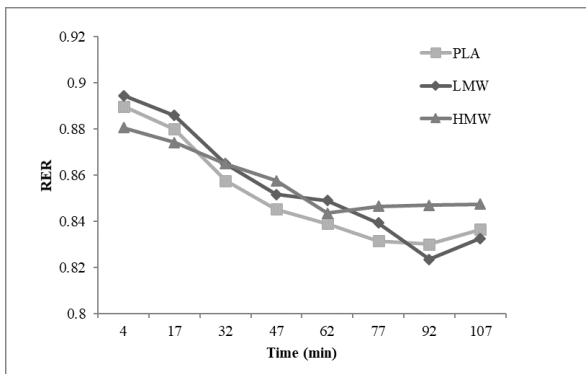


'Skinny fat' is prevalent among college students, particularly in males.

Source: Anderson et al. In Review. 2018.

Sports Supplements

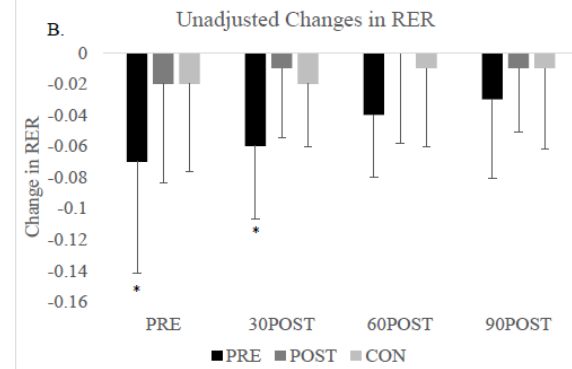
Molecular weight of CHO supplementation does not influence performance in trained female cyclists



Source: Mock et al. JSCR. 2017

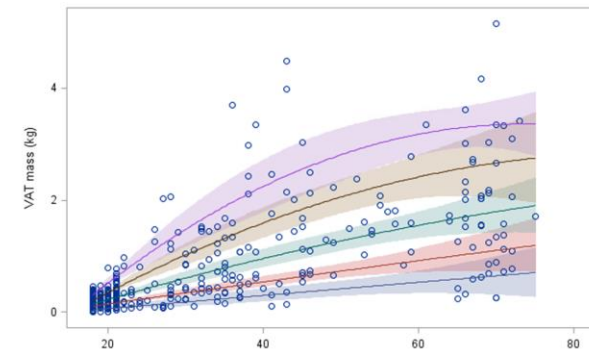
Body Composition & Exercise

Timing nutrients before (PRE) or after (POST) high intensity resistance training in trained females improves strength and metabolism compared to fasting.



Source: Phiocker et al. JSAMS. In Review. 2018.

Establishment of normative scores for visceral fat from DXA may be clinically useful. VAT measurements provide important information about metabolic and cardiovascular disease risk.



Source: Hirsch et al. In Review. 2018

Lee Stoner, Ph.D., MPH, Assistant Professor



Positions:

Director of the Cardiometabolic Lab

Research Interests:

Lifestyle risk factors and cardio-metabolic disease.

Assessment of cardio-metabolic health.

Translation of basic and applied science.

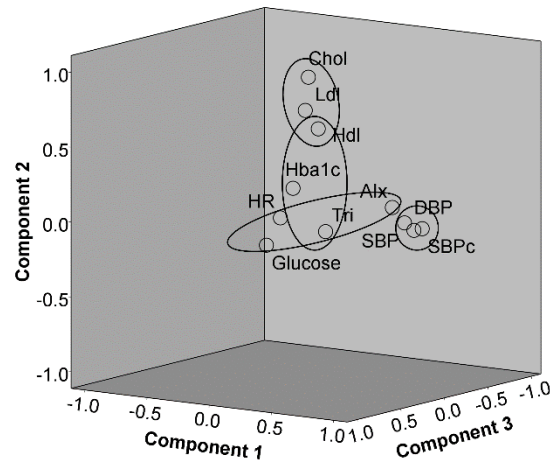
Recent Publications:

- **Stoner L**, Hanson ED, Gram M, Allen JD, Malin SK. A Research toolbox for peripheral arterial disease: noninvasive assessment of the vasculature and skeletal muscle. *Circulation*
- **Stoner L**, Weatherall M, Skidmore P, Castro N, Lark S, Faulkner J, Williams M. (2017). Cardio-metabolic risk variables in pre-adolescent children: a factor analysis. *JAHA*. 6(10): e007071
- Borrer A, Zieff G, Battaglini B, **Stoner L**. (2018). The effects of post-prandial exercise on glucose control in individuals with type 2 diabetes: A systematic review. *Sports Medicine*. 48(6): 1479-1491.
- Lucero A, Addae G, Lawrence W, Neway B, Credeur C, Faulkner J, Rowlands D, **Stoner L**. (2018). Reliability of muscle blood flow and oxygen consumption response from exercise using near-infrared spectroscopy. *Experimental Physiology*. 103(1):90-10.
- **Stoner L**, Credeur D, Fryer S, Faulkner J, Lambrick D, Gibbs BB. (2017). Reliability of Pulse Waveform Separation Analysis: Effects of Posture and Fasting. *J of Hypertension*. 35(3):501-5.

Recent Graduate Student Projects under Dr. Stoner

Cardiometabolic health in children

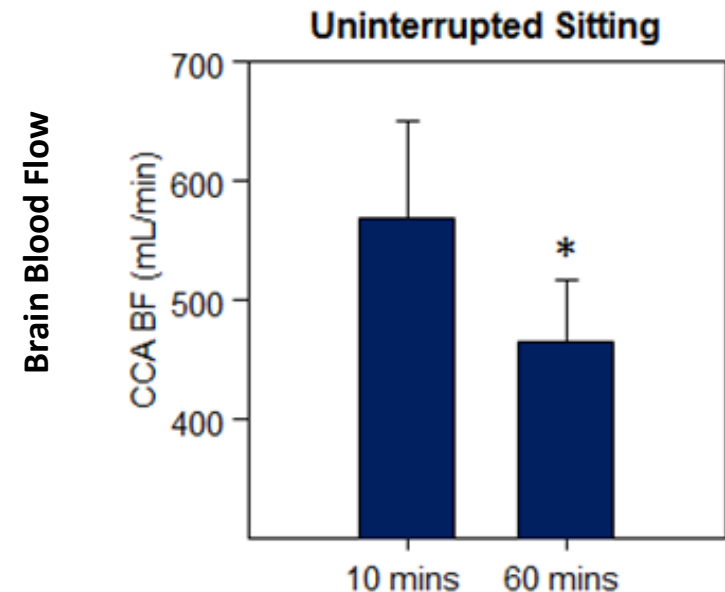
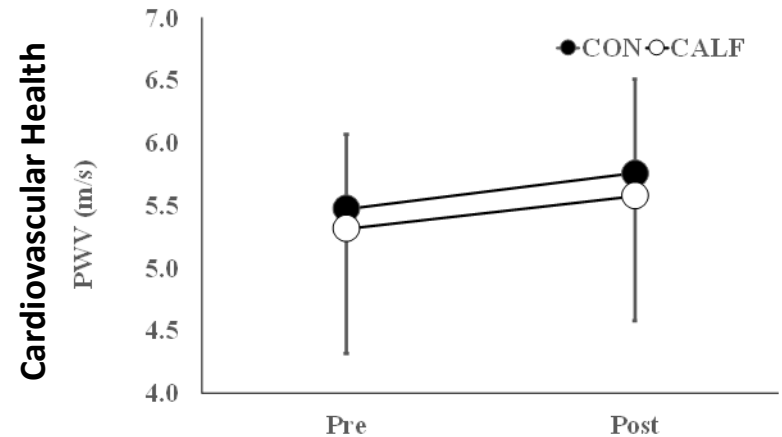
Principle component analysis to determine to clustering of cardiometabolic risk factors.



Multivariate model suggests body fat, strength, sedentary time, and fruit/veg intake are important.

	Univariate				Multivariate Adjusted			
	β	LCI	UCI	<i>P</i>	β	LCI	UCI	<i>P</i>
W:Hip	1.869	0.162	3.576	0.032	0.938	-2.827	4.702	0.625
Body Fat (%)	0.024	0.014	0.035	0.000	0.035	0.004	0.066	0.029
VO2max	-0.034	-0.057	-0.011	0.004	-0.026	-0.100	0.047	0.480
Strength	0.021	-0.004	0.046	0.095	0.082	0.024	0.139	0.005
Sedentary (mins)	0.000	0.000	0.001	0.407	0.002	0.001	0.003	0.001
SocialLag	0.163	-0.020	0.346	0.081	0.075	-0.269	0.418	0.670
Processed Foods	0.015	-0.043	0.073	0.616	-0.031	-0.157	0.095	0.634
Fruit/Veg	-0.052	-0.121	0.018	0.143	-0.133	-0.264	-0.002	0.047

Effects of Prolonged Sitting on Cardiovascular Health



EXSS Pictures



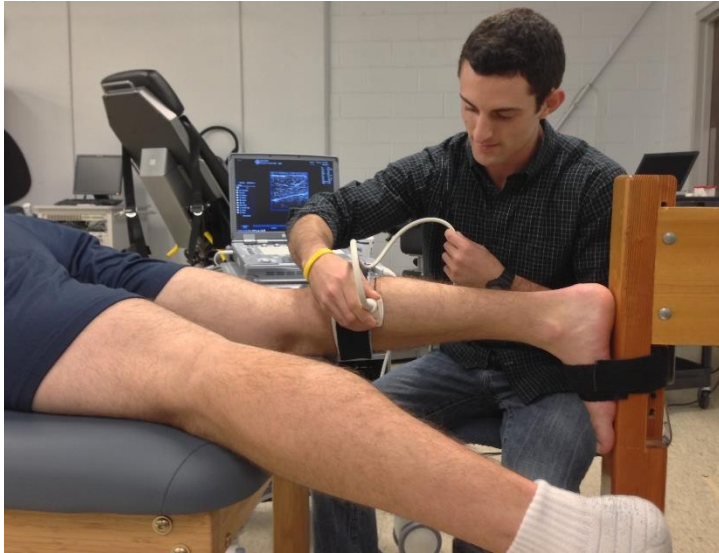
EXSS Pictures



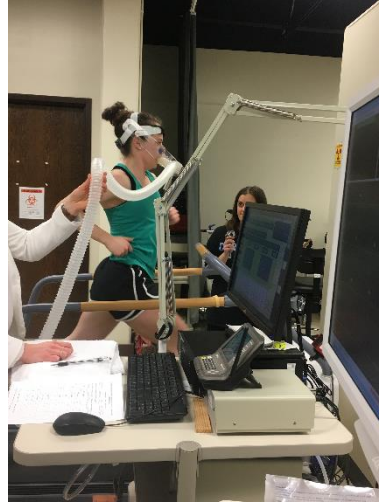
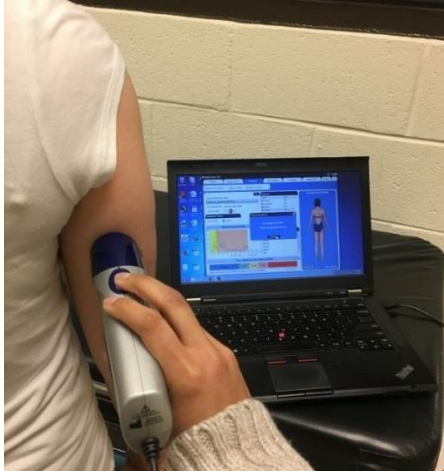
EXSS Pictures



EXSS Pictures



EXSS Pictures



EXSS Pictures

