This is provided as an example proposal. It is important that you follow the current guidelines.

The mentor letter has been removed.

A PROPOSAL TO STUDENT ENHANCEMENT AWARD REVIEW COMMITTEE

TITLE OF PROJECT: The DART Study: Exercise Strategies to Improve Physical Function in Older Adults

NAME OF APPLICANT: Dallin Tavoian

STATUS: ( ) Undergraduate (X) Graduate ( ) Medical

CAMPUS/LOCAL ADDRESS: Irvine 355, Ohio University
E-MAIL ADDRESS: dt314412@ohio.edu
DEPARTMENT: Biomedical Sciences

EXPECTED GRADUATION DATE (Month and Year): May 2021

RE-SUBMISSION: (X) YES (Original Submission Date 2019) ( ) NO

PROPOSAL CATEGORY (select one):
(X) Life/Biomedical
( ) Arts/Humanities
( ) Social/Behavioral
( ) Physical Sciences/Engineering

BUDGET: Total Request $6,000
(May not exceed $6,000)

FACULTY MENTOR INFORMATION:
NAME: Brian Clark
E-MAIL ADDRESS: clarkb2@ohio.edu
DEPARTMENT: Biomedical Sciences
DEPARTMENT ADMIN./E-MAIL: omni@ohio.edu hartt@ohio.edu

IRB AND IACUC APPROVAL:
To ensure that the University is in compliance with all federal regulations, complete the checklist below. *Note: your proposal can be approved prior to IRB or IACUC approval (put "pending" or "to be submitted" instead of approval number), but funding will be withheld until notification of approval or exemption.*

Yes	No	Office of Research Compliance	Policy #
(X)	( )	Human Subjects in Research (including surveys, interviews, educational interventions): Institutional Review Board (IRB) Approval #: 18-F-55 Expiration Date: 10/02/20	19.052
( )	( )	Animal Species: Institutional Animal Care & Use Committee (IACUC) Approval #: Expiration Date:	19.049

SIGNATURES

Applicant's Signature		Faculty Mentor's Signature	
Signature		Signature	Brian C. Clark
Name	Dallin Tavoian	Name	Brian Clark
Dept/School	Biomedical Sciences	Unit	OMNI
Date	1/17/20	Date	17-JAN-2019

Dean Name	THOMAS ROSOL, CHAIR, BMS
Dept/School	HCOM
Signature	Thomas Rosol

Optional:
If selected for funding, I give permission to the Office of the Vice President for Research and Creative Activity to use my proposal as an example during training and workshop exercises. (Sign below)
Signature: Date: 1/17/20

STUDENT ENHANCEMENT AWARD
APPLICATION CHECKLIST

Applicants **must** complete and sign the checklist. The checklist should be included as the second page of the application (following the cover page).

☑ Cover page	use SEA form
☑ Checklist	use SEA form
☑ Abstract*	1 double-spaced page
☑ Resubmission Summary (***For Re-submissions Only***)*	1 double-spaced page
☑ Project Narrative	5 double-spaced pages
☑ Glossary/Definition of Terms* (***Not required***)	2 double-spaced pages
☑ Bibliography (***Not required***)	2 pages
☑ Presentation of Results	1 double-spaced page
☑ Mentor's Endorsement	1 page
☑ Biographical information (***Applicant(s) and key personnel***)	3 pages per person
☑ Budget and Justification	no limit specified (Including the OHIO-Affiliated Travel Form, if applicable)
☑ Appended Materials/Multimedia Files	5 pages; and no more than 10 minutes of footage
☑ Electronic copy of proposal	Single Acrobat file, containing entire proposal and required signatures

Sections marked with a bullet (*) identify text sections that should be written in language understandable by an informed layperson to assist the Committee in its review.

*****Please Note: The committee has the right to return without review any proposals that do not conform to these format requirements*****

Applicant signature: _____

ABSTRACT

The purpose of this project is to test the hypothesis that high-intensity interval training can elicit the benefits of both resistance training (improved muscle mass, strength, and power) and moderate-intensity aerobic training (improved heart and lung function) in a physically inactive population of older adults. Habitual exercise is essential to maintaining mobility and independence with advancing age, and both resistance training and aerobic training are recommended to obtain maximal health benefits. However, most older adults do not exercise regularly, and <12% meet both aerobic and resistance recommendations concurrently. Consequently, most older adults are either not getting the necessary muscular adaptations, or they are not getting the necessary cardiorespiratory adaptations. We hypothesize that bicycle high-intensity interval training (HIIT) can improve muscular mass and strength, in addition to improving heart and lung function. Cycling is unique in that it appears to not impede muscular strength when done concurrently with resistance training, an important distinction from other types of aerobic exercise. To date there have been no studies that have systematically compared HIIT against established exercise strategies in older adults. We will recruit 30 insufficiently active adults aged 60-75 and assign them to one of three 12-week exercise programs: 3x/week of bicycle HIIT, bicycle moderate-intensity continuous training, or strength training. Before and after the 12-week program we will measure lower extremity muscle mass and strength, whole body fat mass, maximal aerobic capacity, and maximal walking distance in six minutes. If bicycle HIIT is shown to be effective it will pave the way for a paradigm shift from volume-driven to intensity-driven exercise recommendations for older adults, with the ultimate goal of improving health and reducing age-related physical dysfunction. Additionally, it would address a substantial barrier to exercise adherence in older adults, namely, time commitment required to meet the physical activity guidelines.

RESUBMISSION SUMMARY

Thank you for taking the time to review this resubmission. Below I have included the specific concerns of the previous reviewers, followed by changes that were made to address the concerns.

Reviewer Concern: The proposal didn't explain how this research was novel or timely.

Response: Novelty of the research has been added to the *Significance* and the *Broader Impacts* sections. Timeliness is addressed in the first paragraph of the Project Narrative.

Reviewer Concern: There was no discussion of statistical analyses; however, we appreciate the power analysis

Response: The statistical analysis plan has been added to the *Sample Size and Statistical Analysis* section.

Reviewer Concern: It is often hard to find participants who meet the criteria of "healthy". The inclusion/exclusion criteria need to be more explicit. What about medication, comorbidities, etc. You need to clearly explain what "healthy" means and how you are going to recruit. Similarly, you need to more clearly define your sample population.

Response: Subject characteristics have been added to the *Subjects* section on the second page of the Project narrative to more clearly define the target population.

Reviewer Concern: The committee was concerned that the proposal didn't demonstrate clear broader impacts.

Response: The *Broader Impacts* section has been updated and expanded to address this concern.

Note: Major changes/additions have been italicized

PROJECT NARRATIVE

Nearly half of US adults over age 60 report difficulty performing one or more **activities of daily living** essential to maintaining independence.[1] *Increasing numbers of older adults with disabilities will continue to drive up healthcare costs, making maintenance of health and independence a top priority for both middle-aged and older adults*.[2] Contributors to this functional decline include poor **cardiorespiratory** fitness and skeletal muscle impairments,[3] although exercise is effective at maintaining function in older adults.[4,5] The fact that adaptations have been seen in the oldest adults (90+ years) is particularly encouraging.[6,7] *Unfortunately, less than 12% of older adults meet the exercise recommendations provided by the American College of Sports Medicine (ACSM)*,[1,8] that are based on the long-held tenet that the adaptations seen in response to **aerobic training** (cardiorespiratory fitness) and **resistance training** (muscle mass, strength, and power) are independent of one another.[8] Consequently, the majority of older adults who do exercise are either not getting the necessary muscular adaptations, or they are not getting the necessary cardiorespiratory adaptations for maintaining independence. However, recent work in young adults has shown that the adaptations to bicycle **high-intensity interval training** (HIIT) are not limited to enhanced cardiorespiratory function, but can also improve muscle strength[9] and power.[10,11] *Compared to traditional aerobic training, HIIT typically has a greater effect on* ***maximal aerobic capacity*** *(VO_2max) (9.1% greater increase on average) and other* ***cardiovascular disease*** *risk factors (e.g., cholesterol, blood pressure).*[12] While these findings are encouraging, the effectiveness of HIIT as a general exercise strategy for older adults has not been adequately investigated. The few studies reporting physiological adaptations to HIIT in older adults have had one or more of the following methodological confounds: *1)* they lacked an active control group that followed established exercise recommendations, *2)* they were short-term

interventions, and/or *3)* the target population had overt diseases/health conditions, which may limit generalizability to the large number of older adults that are generally healthy. [12–18]

The lack of investigations that directly compare unique exercise strategies against established strategies represents a critical barrier to progress in the field of healthy aging. With this in mind, the DART Study (Dual-benefits of Aerobic and Resistance Training) is a phase 1B proof-of-concept, proof-of mechanism clinical trial that seeks to determine if bicycle HIIT is a more efficient standalone strategy to improve cardiovascular and lower extremity muscular function than established resistance or aerobic exercise training programs. We will test this "dual-benefits hypothesis" in **insufficiently active** older adults that have yet to develop **mobility limitations**, but who, without intervention, could very likely develop mobility limitations in the future due to inactivity and normal time course of aging.

Design: This is a single-blinded randomized control trial with a three (group) by two (time) repeated measures factorial design.

Subjects: Adults between 60-75 years of age and without serious health conditions will *be recruited via the Ohio Musculoskeletal and Neurological Institute's database*. They will be randomly assigned (stratified by sex) to one of three exercise protocols: bicycle HIIT, bicycle moderate-intensity continuous training (MICT), or resistance training (RT). Participants will complete an in-depth health screening to confirm that they are at low risk of suffering an exercise-induced cardiac event prior to enrollment. *To meet the inclusion criteria, participants may not have any neuromuscular, metabolic, or cardiovascular conditions, and must not have any functional impairments that would limit their ability to perform the required tests or exercises involved in the study. Participants will be excluded if they are taking medications that could affect study outcomes (e.g., anti-obesity drugs). Additionally, participants will be excluded if they are*

currently meeting either the aerobic training or resistance training recommendations set forth by the ACSM.[8] An in-depth protocol for this study has recently been published.[19]

Sample Size and Statistical Analysis: A power analysis suggests a sample size of 7-10 per group to achieve a power of 0.80-0.95 (21-30 subjects in total). *Percent change from baseline will be calculated for all measures, and we will test differences in group means using one-way ANOVA. Tukey post hoc tests will be performed if significant differences exist between groups, alpha=0.05.*

Training Protocols: Participants will attend supervised exercise sessions 3x/week for 12 weeks. For the MICT and HIIT protocols, heart rate will be tracked to ensure that target intensities are being achieved. All exercise sessions will be supervised by an experienced exercise trainer certified in CPR and AED use. *RT Protocol:* Participants will perform 10 resistance exercises (Table 1), 7 of which will target the lower extremities, based on recommendations from the ACSM for older adults.[8] High-repetition/low-weight exercises will be performed initially and progress to low-repetition/high-weight exercises as strength and endurance improve. Rest between sets will be 30-90 seconds (Table 2). Weights will be adjusted based on the participant's **rating of perceived exertion** (RPE) for each exercise. The ACSM recommends using weights that elicit a RPE of 5-8 for each set, on a 0-10 scale, for older adults.[8] *MICT Protocol:* Participants will exercise within a preset heart rate range (% of maximal heart rate [HR_{max}]), tracked with a chest heart rate monitor, for a preset duration (Table 2). *HIIT Protocol:* Participants will perform several intervals of high- and low-intensity cycling for set durations. The target heart rate will be tracked with a chest heart

Daily exercises	Rotating exercises
Leg press	Lunges
Knee extensions	Step-ups (weighted or unweighted)
Leg curls	Hip abduction
Calf raises	Hip bridge (single- or double-leg)
Chest press	Box squat
	Sumo squat
	Planks (knee and elbows or knees and toes)
	Biceps curls
	Push-ups (incline or flat)
	Seated cable pull-down
	Seated cable row
	Triceps extensions
	Shoulder overhead press
	Lateral arm raises

Table 1. Participants will perform the five *Daily Exercises*, and five exercises chosen by the exercise supervisor from the list of *Rotating Exercises*.

monitor and range from 80-100% of HR_{max} and 40-60% of HR_{max} during the high- and low-intensity portions, respectively (Table 2). Intervals will consist of a high/low-intensity ratio of 1:1 (e.g., 30 seconds high followed by 30 seconds low) ranging from 15-60 seconds in duration.

	Week 1-2	Weeks 3-4	Weeks 5-8	Weeks 9-12
RT	Sets: 1-2 Reps: 15-20 RPE: 5-6 Rest: 30-60 sec	Sets: 2-3 Reps: 12-20 RPE: 5-8 Rest: 60-90 sec	Sets: 3-4 Reps: 10-20 RPE: 6-8 Rest: 60-90 sec	Sets: 3-5 Reps: 6-20 RPE: 7-8 Rest: 60-90 sec
MICT	20-30 min 50-60% HR_{max}	30-40 min 60-70% HR_{max}	35-45 min 65-75% HR_{max}	40-50 min 70-80% HR_{max}
HIIT	15-20 min H: 75-85% HR_{max} L: 40-60% HR_{max}	15-25 min H: 80-95% HR_{max} L: 40-60% HR_{max}	20-35 min H: 80-100% HR_{max} L: 40-60% HR_{max}	20-40 min H: 85-100 HR_{max} L: 40-60% HR_{max}

Table 2. Progression of exercise protocols. **HIIT**, high-intensity interval training; **HRmax**, maximal heart rate; **MICT**, moderate-intensity continuous training; **Reps**, repetitions; **RPE**, rating of perceived exertion; **RT**, resistance training.

Methods: *1)* Maximal aerobic capacity will be obtained with a metabolic cart during a graded exercise test (GXT) on a cycle ergometer. Participants will pedal at 15 watts (W) on a magnetically braked cycle ergometer maintaining a pedal frequency of 50-80 RPM. Power output will increase by 15 W/minute until participants can no longer pedal at 50 RPM. 12-lead electrocardiograms (ECGs) will be monitored in real time to detect possible heart abnormalities during testing, and the test will be terminated based on recommendations from the ACSM.[20] *2)* Leg extensor strength will be measured with participants seated in an **isometric dynamometer** with the knee bent to 90 degrees. They will be asked to perform three isometric leg extensions, and the highest force value will be considered maximal strength. *3)* 6-minute walk distance will be obtained by having participants walk at maximum pace for six minutes, and total distance covered will be recorded. *4)* Muscle size will be determined using **magnetic resonance imaging** as we have previously described.[21] *5)* Fat mass will be quantified via **dual-energy X-ray absorptiometry** (DXA) as we have previously described.[21]

Research Timeline: To date we have had 14 participants complete the study. We are able to maintain eight participants on protocol concurrently, and we expect to complete data collection by October 2020.

Expected Results: *1)* HIIT will result in improvements in VO_2max, 6-minute walk distance, and fat mass similar to MICT, and greater than RT. *2)* HIIT will result in improvements in leg extensor strength and muscle mass similar to RT, and greater than MICT.

Significance: The possibility that a single exercise strategy could have multiple benefits is extremely significant as it addresses a substantial barrier to exercise adherence in older adults by reducing the weekly time commitment of exercise. Additionally, since most older adults who do exercise only perform one type of exercise, the strategy with the greatest overall impact on health and physical function should be promoted. By including both aerobic and resistance training control groups, as well as obtaining both cardiorespiratory and muscular measures, we will be able to directly compare HIIT against established strategies to determine which of the three is the best standalone strategy for those individuals who choose to only perform one type of exercise.

Broader Impacts: *To our knowledge this is the first study that compares HIIT to both resistance and aerobic training in older adults through the collection of physiological measures. If our hypothesis is correct it has the potential to pave the way for a paradigm shift from volume-driven to intensity-driven exercise recommendations for older adults. Additionally, this project will provide a framework for future researchers to investigate different interval durations and number of intervals in order to create a HIIT protocol that maximizes the beneficial adaptations. Finally, this project will provide several Ohio University students with valuable human research experience. To date, we have trained two graduate and two undergraduate students to supervise exercise sessions, assist with data collection, and/or manage the research database.* The results of this study will be published in an open-access journal, and will also be presented in my dissertation defense that will be open to the public.

GLOSSARY AND ABBREVIATIONS

Activities of daily living: Daily activity performed for self-care, including feeding oneself, bathing, dressing, and grooming.

Aerobic training: Any of various sustained activities (walking, jogging, swimming, cycling) that requires use of the body system that utilizes oxygen to produce energy.

Age-related disability: The reduction in ability to perform every-day tasks due to the progressive decline in muscle mass, strength and power beginning around the age of 65.

Cardiorespiratory: Relating to the action of both the heart and lungs

Cardiovascular disease: Conditions that involve narrowed or blocked blood vessels that can lead to heart attack or stroke. Cardiovascular disease is the leading cause of death in the world.

Dual-energy X-ray absorptiometry: A medical imaging device that can assess body composition.

High-intensity interval training: An exercise strategy that alternates short periods of maximal or near-maximal exercise with low-intensity recovery periods.

Insufficiently active: Adults not currently meeting the aerobic training or resistance training recommendations set forth by the ACSM.

Isometric dynamometer: A device with a sensor that measures forces applied to a lever arm.

Maximal aerobic capacity: The maximum rate of oxygen usage an individual can attain during exercise.

Mobility limitations: difficulty walking for 400 meters or climbing one flight of stairs. The initial stage of total loss of independent walking.

Magnetic resonance imaging: An imaging device that can be used to quantify muscle size.

Rating of perceived exertion: A scale that can be used by individuals to measure intensity of exercise, from the perspective of the individual performing the exercise.

Resistance training: A form of exercise that improves muscular strength and endurance by moving your limbs against resistance provided by body weight, bands, weighted bars, or machines.

ACSM: American College of Sports Medicine

AED: Automated external defibrillator

CPR: Cardiopulmonary resuscitation

DART: Dual-benefits of aerobic and resistance training

DXA: Dual-energy X-ray absorptiometry

ECG: Electrocardiograph

GXT: Graded exercise test

HIIT: High-intensity interval training

MICT: Moderate-intensity continuous training

RPE: Rating of perceived exertion

RT: Resistance training

VO_2max: Maximal oxygen consumption

W: Watts

BIBLIOGRAPHY

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8. Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, et al. Exercise and physical activity for older adults. *Medicine & Science in Sports & Exercise*. 2009;41(7):1510-1530. doi:10.1249/MSS.0b013e3181a0c95c

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12. Weston KS, Wisløff U, Coombes JS. High-intensity interval training in patients with lifestyle-induced cardiometabolic disease: a systematic review and meta-analysis. *British Journal of Sports Medicine*. 2014;48(16):1227-1234. doi:10.1136/bjsports-2013-092576

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19. Tavoian D, Russ DW, Law TD, et al. A randomized clinical trial comparing three different exercise strategies for optimizing aerobic capacity and skeletal Muscle performance in older adults: protocol for the DART study. *Front Med*. 2019;6:15. doi:10.3389/fmed.2019.00236

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PRESENTATION OF RESULTS

This work will fulfill the requirements for my dissertation in the Translational Biomedical Sciences (TBS) Program. I also plan to present my findings at the annual Gerontological Society of America (GSA) conference November 4-8, 2020 in Philadelphia, PA. I will present a poster at the conference, and will submit an application to give a presentation during the scheduled sessions. The GSA is the largest and most established interdisciplinary scientific organization devoted to the advancement of gerontological research, learning, and practice in the United States. My project is designed to address specific barriers to exercise adherence in older adults, and the opportunity to present to researchers, clinicians, and industry leaders is essential as I transition from a PhD student to an independent researcher in the field of healthy aging.

The results will also be presented at OU's annual Student Research and Creative Activity Expo in 2021. I expect to publish multiple chapters of my dissertation, and all manuscripts will be open access, as stipulated in the regulations of my American Heart Association Predoctoral Fellowship. Potential journals include *Medicine and Science in Sports and Exercise*, *Journals of Gerontology: Medical Sciences*, and *Age and Ageing*.

Not only will I gain valuable experience from writing manuscripts and presenting at these conferences, I will also have several opportunities to implement the translational techniques that I am learning as a PhD student in the TBS program. Some of the major competencies I am expected to develop include communicating and interacting with professionals from different disciplines, responding appropriately to peer-review and effectively translating results from one discipline to be presented in an interdisciplinary setting where others can benefit. Attending and presenting at conferences will be an effective way to achieve these competencies.

BIOGRAPHICAL SKETCH

NAME: Tavoian, Dallin

POSITION TITLE: AHA Predoctoral Research Fellow

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Southern Utah University	B.S.	08/2008	05/2013	Exercise Science
Ohio University	M.S.	07/2013	05/2015	Athletic Training
Ohio University	Ph.D.	08/2015	05/2021	Translational Physiology

Current GPA: 3.7

PERSONAL STATEMENT

My research interests are, broadly speaking, related to the integration of aging systems physiology and modifiable lifestyle factors (e.g., exercise, nutrition, etc.) for the enhancement of mobility, physical function, and independence in older adults. My clinical experience as an athletic trainer, paired with my research experience in both animals and humans, has prepared me to be a translational researcher in the field of healthy aging. The Student Enhancement Award would provide much needed support and funding for my dissertation project, a proof-of-concept, proof-of-mechanism clinical trial to determine the effectiveness of high-intensity interval training to induce both cardiorespiratory and muscular benefits, which we dub the "dual-benefits hypothesis". During this proposed project I will gain experience in the development, preparation, and execution of a large-scale research project under the direction of Dr. Brian Clark and Dr. David Russ, both of whom have had extensive experience with clinical trial research. The Student Enhancement Award would ensure access to all necessary equipment and provide subjects with compensation for their commitment.

PUBLICATIONS

BC Clark**, D Tavoian**, BH Goodpaster, PM Cawthon, RD Hansen, TM Manini. Comment on "Pitfalls in the measurement of muscle mass: a need for a reference standard" by Buckinx et al. *J Cachexia Sarcopenia Muscle* 2018;9:1269-71. doi: 10.1002/jcsm.12372
Impact Factor: 10.754

D Tavoian, K Ampomah, S Amano, TD Law, BC Clark. Changes in DXA-derived lean mass and MRI-derived cross-sectional area of the thigh are modestly associated. *Sci Rep*. 2019;9(10028):9. doi: 10.1038/s41598-019-46428-w
Impact Factor: 4.122

D Tavoian, DW Russ, TD Law, JE Simon, PJ Chase, EH Guseman, BC Clark. A randomized clinical trial comparing three different exercise strategies for optimizing aerobic capacity and

skeletal Muscle performance in older adults: protocol for the DART study. *Front Med*. 2019;6:15. doi: 10.3389/fmed.2019.00236
Impact Factor: 3.113

D Tavoian, WD Arnold, SC Mort, S de Lacalle. Sex differences in body composition but not neuromuscular function following long-term, doxycycline-induced reduction in circulating levels of myostatin in mice. *PLOS One*. 2019;14(11):e0225283. doi: 10.1371/journal.pone.0225283
Impact Factor: 2.776

EXHIBITIONS

D Tavoian, WD Arnold, S de Lacalle. *Neurological and Behavioral Adaptations to Myostatin Deletion in Adult Female Mice.* Abstract for poster presentation. 2016 Society for Neuroscience annual meeting, San Diego, CA.

D Tavoian, WD Arnold, S de Lacalle. *Changes in Neuromuscular Function with Aging and Myostatin Deletion.* Abstract for poster presentation. 2018 Winter Conference on Brain Research, Whistler, British Columbia, Canada.

RELEVANT COURSEWORK

YEAR	COURSE TITLE	GRADE	YEAR	COURSE TITLE	GRADE
	SOUTHERN UTAH UNIVERSITY			**SOUTHERN UTAH UNIVERSITY**	
2010	Medical Terminology	A-	2012	Biology	A-
2010	Motor Learning	B	2012	Human Anatomy	A
2010	Sports Medicine	B	2012	Sport and Exercise Biomechanics	A
2011	Human Physiology	B-	2013	Methods of Sports Conditioning	A
2011	Technical Writing	A-	2013	Research Methods in Ex. Sci.	A-
2011	Sports Nutrition	B+	2013	Clinical Applications of Ex. Sci.	A-
2011	Exercise Physiology	B-	2013	Exercise Testing and Prescription	A
2012	Therapeutic Exercise	A	2013	Studies in Exercise Science	A-
	OHIO UNIVERSITY (Master's)			**OHIO UNIVERSITY (Master's)**	
2013	Research Methods and Stats	A	2014	Neuromechanics	B+
2013	Human Anatomy	C+	2015	Athletic Training Research II	A-
2013	Athletic Training Research I	A			
	OHIO UNIVERSITY (Doctoral)			**OHIO UNIVERSITY (Doctoral)**	
2015	Physiology of Exercise	A-	2016	Writing in Graduate Studies	CR
2015	Research Ethics	A	2016	Bioethics	A
2015	Tools in Translational Research	A	2017	Data Analytics	A
2016	Advanced Biomechanics	A	2017	Advanced Statistics	A-
2016	Human Neuroscience	C+	2017	Data Management	CR
2016	Interprofessional Epidemiology	A			

Some Southern Utah University classes are graded as P (pass) or F (fail). Passing is 70% or better. Some Ohio University classes are graded CR (credit) or NC (no credit). Students must attend 75% of classes for credit.

LICENSURE AND CERTIFICATION

2013 Basic Life Support for Healthcare Providers, American Heart Association
2013 BOC Certification, National Athletic Trainers' Association, #2000012859
2014 IASTM Técnica Gavilán, Técnica Gavilán PTB
2015 Ohio Athletic Training Licensure, Ohio OTPTAT Board, #AT004735
2018 Advanced Cardiac Life Support, American Heart Association

SPECIAL TRAINING

2017 Magnetic Resonance Imaging Scan Technical Training, Esoate SpA
2018 Myology Course, Nationwide Children's Hospital/Ohio State University
2019 Certificate Program in Clinical Trial Project Management, Physis Global Academy

AWARDS AND FELLOWSHIPS

2014 Gary S. Neiman Graduate Student Research Award, Ohio University
2015-2019 OHF Fellowship, Osteopathic Heritage Foundations (OHF) Graduate Assistantship Program at Ohio University Heritage College of Osteopathic Medicine
2018-2019 John J. Kopchick Molecular and Cellular Biology/Translational Biomedical Sciences Research Fellowship Award, Ohio University
2019-2021 American Heart Association Predoctoral Fellowship, American Heart Association

HONORS

2007 Eagle Scout, Boy Scouts of America
2010-2013 Commissioner's List of Excellence, Track and Field, Southern Utah University
2010-2013 Academic All-Conference, Track and Field, Southern Utah University
2013 Dean's List, Southern Utah University
2015 CHSP Interdisciplinary Research Case Competition (2nd place), Ohio University

LEADERSHIP

2011-2013 Treasurer, Sigma Nu Fraternity, Southern Utah University
2013-2015 Clinical Preceptor, Athletic Training Department, Ohio University
2014-2015 Study Abroad Assistant Director, Athletic Training Department, Ohio University
2016-2018 Scout Leader, Boy Scouts of America, The Plains, OH

OTHER FUNDING SOURCES

2019-2021 AHA Fellowship, student stipend, $4,000 toward project costs, expires 6/30/21
2019 John J. Kopchick Molecular and Cellular Biology/Translational Biomedical Sciences Research Fellowship Award, $7,500 toward student research, $2,500 student stipend

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Chase, Paul

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Assistant Clinical Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
Bowling Green State University, Bowling Green, OH	BS	05/1997	Exercise Specialist
Bowling Green State University, Bowling Green, OH	MED	05/2000	Developmental Kinesiology
University of North Carolina at Greensboro, Greensboro, NC	PHD	12/2014	Kinesiology

A. Personal Statement

As a clinical exercise physiologist and a clinical professor of exercise physiology, I have extensive clinical and research experience with analyzing electrocardiograms and obtaining blood pressure at rest and during exercise. For the last 4 years I have been instructing undergraduate and graduate students in electrocardiographic analysis and interpretation during rest and exercise. I have also authored and co-authored an extensive number of papers in the area of cardiopulmonary exercise testing in patients with chronic heart failure. In this work I strive to optimize the application of cardiopulmonary exercise testing to predict outcomes in patients with heart failure. This work has reinforced the importance of electrocardiographic variables, the importance and influence of implanted cardiac pacemakers, and the value of directly measured ventilatory gas exchange at rest and during exercise. Although my work is primarily related to the role of ventilatory efficiency in risk stratification, the influences of cardiac electrical conduction is a critically important variable to understand when working with senior adult participants.

1. Tavoian D, Russ DW, Law TD, Simon JE. Chase PJ, Guseman EH, Clark BC. A randomized clinical trial comparing three different exercise strategies for optimizing aerobic capacity and skeletal muscle performance in older adults: Study protocol for The DART Pilot Study. *Front Aging Neurosci.* 2019;6:236.

2. Brawner CA, Ehrman JK, Myers J, Chase P, Vainshelboim B, Farha S, Saval MA, McGuire R, Pozehl B, Keteyian SJ. Exercise Oscillatory Ventilation: Interreviewer Agreement and a Novel Determination. Med Sci Sports Exerc. 2018 Feb;50(2):369-374. PubMed PMID: 28902683; PubMed Central PMCID: PMC5772890.

3. Keteyian SJ, Patel M, Kraus WE, Brawner CA, McConnell TR, Piña IL, Leifer ES, Fleg JL, Blackburn G, Fonarow GC, Chase PJ, Piner L, Vest M, O'Connor CM, Ehrman JK, Walsh MN, Ewald G, Bensimhon D, Russell SD. Variables Measured During Cardiopulmonary Exercise Testing as Predictors of Mortality in Chronic Systolic Heart Failure. J Am Coll Cardiol. 2016 Feb 23;67(7):780-9. PubMed PMID: 26892413; PubMed Central PMCID: PMC4761107.
4. Chase PJ, Davis PG, Wideman L, Starnes JW, Schulz MR, Bensimhon DR. Comparison of Estimations Versus Measured Oxygen Consumption at Rest in Patients With Heart Failure and Reduced Ejection Fraction Who Underwent Right-Sided Heart Catheterization. Am J Cardiol. 2015 Dec 1;116(11):1724-30. PubMed PMID: 26443561.

B. Positions and Honors

Positions and Employment

2000 - 2004	Research Associate, Institute for Exercise and Environmental Medicine, Presbyterian Hospital of Dallas, Dallas, TX
2003 - 2004	Clinical Exercise Physiologist, Non-Invasive Cardiology/Nuclear Medicine, Presbyterian Hospital of Dallas, Dallas, TX
2004 - 2004	Senior Exercise Physiologist/Laboratory Supervisor, Duke Diagnostic Laboratory, Duke Center for Living, Durham, NC
2005 - 2005	Senior Exercise Physiologist, Cardiac Diagnostic Unit, Division of Cardiovascular Medicine, Duke University Medical Center, Durham, NC
2005 - 2008	Director, CPX Core Laboratory, LeBauer Cardiovascular Research Foundation, Cone Health, Greensboro, NC
2005 - 2014	Research Coordinator, LeBauer Cardiovascular Research Foundation, Cone Health, Greensboro, NC
2005 - 2016	Senior Clinical Exercise Physiologist, Cardiopulmonary Exercise Laboratory, Cone Health, Greensboro, NC
2014 - 2016	Quality Data Manager, Advanced Heart Failure Clinic, Cone Health, Greensboro, NC
2015 - 2015	Part-time Lecturer, Kinesiology Department, School of Health and Human Performance, University of North Carolina at Greensboro, Greensboro, NC
2015 - 2016	Visiting Assistant Professor, Exercise Physiology, School of Applied Health Sciences and Wellness, College of Health Sciences and Professions, Ohio University, Athens, OH
2016 -	Assistant Clinical Professor, Exercise Physiology, School of Applied Health Sciences and Wellness, College of Health Sciences and Professions, Ohio University, Athens, OH
2017 -	Graduate Coordinator, Exercise Physiology, School of Applied Health Sciences and Wellness, College of Health Sciences and Professions, Ohio University, Athens, OH

Other Experience and Professional Memberships

1996 -	Member, American College of Sports Medicine
2009 -	Member, Clinical Exercise Physiology Association

2014 - 2015	Member, Cone Health Ventricular Assist Device Continuous Program Improvement Committee
2015 - 2015	Member, Patient and Community Resource Engagement Sub-Committee, Triad Health Network Heart Failure Initiative
2016 -	Member, Midwest Chapter of American College of Sports Medicine
2016 -	Member, American Association of Cardiovascular and Pulmonary Rehabilitation
2016 -	Member, Ohio Association of Cardiovascular and Pulmonary Rehabilitation
2016 –	Continuing Education Committee Member, Clinical Exercise Physiology Association
2017-	Evidence Analyst, American College of Sports Medicine

Honors

1998	Department of Human Movement, Sport and Liesure Studies Student Research Award, Bowling Green State University
2011	Mary C. Reiley Memorial Student Travel Award, University of North Carolina at Greensboro

C. Contribution to Science

My work has continued to increase the value and importance of cardiopulmonary exercise testing in patients with chronic heart failure. Furthermore, I have increased the acceptance of ventilatory efficiency as an important independent indicator of the severity of heart failure. My work in the limitations of breathing in patients with heart failure has also brought to light the importance of exercise oscillatory ventilation in the prognosis of heart failure.

Complete List of Published Work in My Bibliography:
http://bit.ly/2dsifdw

BIOGRAPHICAL SKETCH

NAME: Emily Hill Guseman, PhD

eRA COMMONS USER NAME: eguseman

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Pennsylvania State University	B.S.	08/2003	Kinesiology
University of North Carolina – Chapel Hill	M.A.	08/2005	Exercise Physiology
Michigan State University	Ph.D.	08/2012	Pediatric Exercise Physiology
Helen DeVos Children's Hospital and Grand Rapids Medical Education Partners	Research Fellow	08/2012	Clinical Pediatric Obesity Management

A. Personal Statement

The central focus of my research considers how lifestyle behaviors (including physical activity/inactivity and sleep) interact with stress responses to influence the development of obesity, metabolic syndrome, and diabetes during childhood. The underlying hypothesis is that altered stress responses drive the metabolic dysregulation seen in childhood obesity and that the way we respond to stress can be altered through lifestyle changes. The long-term goal of my research is two-fold: (1) to develop effective, primary-care based interventions that improve metabolic function and prevent progression to type 2 diabetes; and (2) to identify early-life factors that can be targeted to reduce excess weight gain beginning in toddlerhood.

My group has published papers relevant to pediatric obesity management at the level of the primary care provider, group-based lifestyle interventions, and intensive clinic-based weight management. Through this work, we have shown that multidisciplinary interventions (including FitKids360) that involve children with obesity and their families can improve lifestyle behaviors, that lifestyle behaviors are predictive of obesity severity, and that both cardiorespiratory and muscular fitness are associated with metabolic health among a sample of adolescents with severe obesity. The scientific environment for obesity research at OUHCOM is strong, with intensive support from the Diabetes Institute and Primary Care Research Initiative. Through these offices, our team has access to outstanding administrative, statistical, and project management resources. These resources, combined with my experience and training, make this an ideal opportunity to test promising strategies to improve pediatric weight management that are embedded within existing healthcare systems.

B. Positions and Honors

2005 – 2007 Exercise Specialist, Department of Cardiology and School of Nursing, Duke University Health System, Durham, NC

2007 – 2008 Research Exercise Physiologist, Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC
2008 – 2012 Doctoral Candidate, Department of Kinesiology, Michigan State University, East Lansing, MI
2011 – 2012 Pediatric Research Fellow, Grand Rapids Medical Education Partners and Helen DeVos Children's Hospital, Grand Rapids, MI
2012 – 2015 Assistant Professor of Physical Activity and Health, Division of Kinesiology and Health, University of Wyoming, Laramie, WY
2014-2018 Board of Directors – At Large Member: North American Society for Pediatric Exercise Medicine
2015-2017 Board of Directors – Wyoming Representative: Rocky Mountain Chapter of the American College of Sports Medicine
2017 – date Pediatric Special Interest Group Co-Chair: American College of Sports Medicine
2017 – date Assistant Professor of Family Medicine, Ohio University Heritage College of Osteopathic Medicine, Athens, OH
2017 – date Investigator, Diabetes Institute, Ohio University, Athens, OH

C. Contributions to Science

a. Metabolic Function and Diabetes in Childhood Obesity. To date, my work in this area has focused primarily on quantifying the variation in metabolic dysfunction found in pediatric obesity and on testing the hypothesis that lifestyle characteristics (including physical activity, stress, and sleep) influence metabolic function independently of weight change. To this end, I developed a novel method for quantifying metabolic health in youth that is based on nationally representative growth curves (1), which improves upon previous methods that were subject to wide variation between study samples. We have demonstrated that cardiorespiratory fitness and muscular fitness are associated with different aspects of metabolic health among children and adolescents with obesity who were seeking obesity treatment (2). We were the first to examine the relationship between metabolic health and total daily cortisol among adolescents with obesity (3) and have also shown that the association between morning cortisol and adiposity varies by weight status (4).

(1) **Guseman EH**, Eisenmann JC, Laurson KR, Cook SR. On the calculation of a continuous metabolic syndrome score using nationally representative reference values. Acad Pediatr. 2018 Jul;18(5):589-592. doi: 10.1016/j.acap.2018.02.011. Epub 2018 Feb 26. PubMed PMID: 29496545.
(2) **Guseman EH**, Cauffman SP, Tucker JM, Smith L, Eisenmann JC, Stratbucker W. The association between measures of fitness and metabolic health in treatment-seeking youth with obesity. Metab Syndr Relat Disord. 2017 Apr;15(3):107-111. doi: 10.1089/met.2016.0094. Epub 2016 Nov 21. PubMed PMID: 27869528.
(3) **Guseman, EH**, Pfeiffer, KA, Carlson, JJ, Stansbury, K, Eisenmann, JC. Physical activity does not attenuate the relationship between daily cortisol and metabolic syndrome in obese youth. J Pediatr Endocrinol Metab. 2016 Jan;29(1):63-70. doi: 10.1515/jpem-2015-0185. PubMed PMID: 26353167.
(4) **Hill, EE**, Eisenmann JC, Gentile DG, Holmes ME, Walsh D. The association between morning cortisol and adiposity in children varies by weight status. J Pediatr Endocrinol Metab. 2011;24(9-10):709-13. doi: 10.1515/jpem.2011.267. PubMed PMID: 22145461.

b. Pediatric Weight Management in Clinical Settings. Here, I have focused on stage 1 (primary care) and stage 3 (specialty clinic-based) weight management. At Ohio University, my group has shown that medical students have positive attitudes toward pediatric weight management and

physical activity more generally, but their knowledge is inadequate to successfully guide patients in managing unhealthy weight gain (1-3). At Helen DeVos Children's Hospital, we developed and published a treadmill protocol to test cardiorespiratory fitness and exercise responses in pediatric weight management facilities (4), which considers the unique needs of children with obesity.

(1) **Guseman, EH**, Beverly EA, Whipps J, Mort S. Foundational knowledge regarding childhood obesity: a cross-sectional study of medical students. BMC Public Health. 2019 Sep 11;19(1):1251. doi: 10.1186/s12889-019-7499-1. PubMed PMID: 31510972; PubMed Central PMCID: PMC6737597.
(2) Whipps J, Mort SC, Beverly EA, **Guseman EH**. Influence of personal health on counseling attitudes and perceived barriers in osteopathic medical students. J Am Osteopath Assoc. 2019 Aug 1;119(8):488-498. doi: 10.7556/jaoa.2019.090. PubMed PMID: 31355889. (*corresponding author)
(3) **Guseman EH**, Whipps J, Howe CA, Beverly EA. First-year osteopathic medical students' knowledge of and attitudes toward physical activity. J Am Osteopath Assoc. 2018 Jun 1;118(6):389-395. doi: 10.7556/jaoa.2018.083. PubMed PMID: 29809256.
(4) Eisenmann, JC, **Guseman, EH***, Morrison, K, Tucker, J, Smith, L, Stratbucker, W. Graded exercise testing in a pediatric weight management center: The DeVos protocol. Child Obes. 2015 Dec;11(6):657-63. doi: 10.1089/chi.2014.0091. Epub 2015 Sep 29. PubMed PMID: 26418857. (*corresponding author)

Complete List of Published Work in My Bibliography
https://www.ncbi.nlm.nih.gov/sites/myncbi/emily.hill guseman.1/bibliography/44851769/public/?sort=date&direction=ascending

D. Additional Information: Research Support (*indicates trainee under my supervision)

1. **Guseman EH,** Whipps J, Howe CA. Role: Principle Investigator, 2019-2020, Efficacy and Feasibility of High Intensity Training for Improving Fitness in the Absence of Weight Loss (HITFIT). Ohio University Research Council, $8000.
2. **Guseman EH.** Role: Principle Investigator, 2019-2020. Adolescent and Parent Perceptions of Opportunities for Diabetes Prevention in Rural Appalachian Southeast Ohio. Pilot and Feasibility Grant, Ohio University Heritage College of Osteopathic Medicine, $7500.
3. Beverly EA**, Guseman EH.** Role: Co-Investigator, 2018-2019, A New Approach to Diabetes Navigation in Rural Appalachia. Rural Health Care Services Outreach Grant No D04RH31792, Health Resources and Services Administration, $600,000 (2018-2021).
4. Beverly EA, **Guseman EH**, Healy A. Role: Co-Investigator, 2017-2019, Achieving a High Level of Wellness by Focusing on the Impact of Diabetes Distress in Rural Appalachia, American Osteopathic Association, $148,253.
5. Beverly EA, **Guseman EH**, Shaub T, Johnson K, Berryman D. Role: Co-Investigator, 2017-2019. Cardiovascular Disease Best Practices Network, Medicaid Technical Assistance and Policy Program (MEDTAPP) grant, $100,149.
6. **Guseman, EH**. Role: Principal Investigator. OUHCOM Startup Funds, 2017-2021, $80,000.
7. **Guseman, EH**. Role: Faculty Advisor. INBRE Graduate Assistantship for Jonathon Whipps*, 2017-2018 (funded, not accepted; $25,431)
8. Bochanski, K*, **Guseman, EH.** Role: Faculty Advisor, 2016-2017. The effect of competitive Nordic skiing on athlete nasal microbiome, c-reactive protein, secretory IgA and heart rate variability. University of Wyoming College of Health Sciences Student Research Grant.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.

Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Law, Timothy, D.

eRA COMMONS USER NAME (agency login):

POSITION TITLE: Medical Director, Clinical and Translational Research Unit (CTRU) and Assistant Professor of Family Medicine

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Moravian College, Bethlehem, PA	BS	06/1985	Biology
Ohio University, Athens, OH	DO	05/1994	Osteopathic Medicine
Indiana Wesleyan University (Marion, IN)	M.B.A.	04/2011	Health Care Management

A. PERSONAL STATEMENT

I am a board certified physician with two decades of clinical experience, and I serve as the Medical Director of the Clinical and Translational Research Unit (CTRU) as well as the Ohio Musculoskeletal and Neurological Institute (OMNI) at Ohio University. During the first decade of my career my primary focus was on military medicine and acute care. During the second decade of my career I transitioned into administration in my roles as a physician for WellPoint, Inc. (the largest managed health care company in the Blue Cross and Blue Shield Association), medical director of Acute Care for the Hardin Memorial Health system (a 10-county regional hospital and health services system in Kentucky), and CEO of, and practicing physician in, Vine Grove Family Medicine, P.S.C. (a small primary care practice with 10,000 patients). More recently I decided to change career paths and transition from my role as a practicing physician and administrator into an academic setting at the Ohio University Heritage College of Medicine. The primary determinant for my switching to an academic setting was to permit me to return to my research roots, which has always been of interest to me personally and professionally. So, while I continue to treat patients in the acute and primary care settings, I have transitioned into an active scientist role with a focus on clinical and translational research on treatment of musculoskeletal pain conditions, and preventative and rehabilitative medicine for older adults and patients with orthopedic and neurological disorders as they relate to fatigue and aging. Ohio University has committed 100% of my time (5 days/week) to administrative, educational, and research responsibilities, and my office is located within the OMNI and CTRU facilities (which are co-located together). I also hold an adjunct faculty appointment in the Department of Geriatric Medicine and hold a staff position at the local hospital (OhioHealth O'Bleness Memorial Hospital).

B. POSITIONS AND HONORS

Positions and Employment

1988-1990 High School Biology & Chemistry Teacher, Monsignor Bonner H.S., Drexel Hill, PA
1990-1991 Adjunct Instructor, Department of Biology, University of Pittsburgh, Pittsburgh, PA
1992-1993 Teaching Assistant, School of Physical Therapy, Ohio University, Athens, OH
1998-2012 Primary Care Physician, Hardin Memorial Health, Elizabethtown, KY
2000-2010 CEO, Vine Grove Family Medicine, Vine Grove, KY
2001-2008 Adjunct Clinical Faculty, University of Kentucky College of Medicine, Lexington, KY
2001-2008 Adjunct Clinical Faculty, University of Louisville School of Medicine, Louisville, KY
2001-2010 Acute Care Medical Director, Hardin Memorial Health, Elizabethtown, KY
2010-2012 Medical Review Officer, Hardin Memorial Health, Elizabethtown, KY
2010-2012 Medical Director & Physician Reviewer, WellPoint, Inc., Indianapolis, IN
2012-Present Assistant Professor of Medicine, Dept. of Family Medicine, Ohio University, Athens, OH
2012-Present Medical Director & Affiliate Scientist, Ohio Musculoskeletal and Neurological Institute (OMNI) at Ohio University, Athens, OH
2014-Present Adjunct Clinical Faculty, Department of Geriatric Medicine, Ohio University Heritage College of Medicine, Athens, OH
2014-Present Medical Director, Clinical and Translational Research Unit at Ohio University Heritage College of Medicine, Athens, OH

Professional Training

1994-1995 Pediatrics Internship, U.S. Army, Brooke Army Medical Center, San Antonio, TX
1995-1998 Family Practice Residency (eq), U.S. Army, Ireland Army Hospital, Fort Knox, KY

Honors

1992 Vice President, Sigma Sigma Phi National Medical Student Honor Society
1992 Outstanding Basic Science Student, Ohio University COM
1994 National Student Doctor of the Year, American Osteopathic Association
1994 Outstanding Community Service Award, Ciba Geigy Pharmaceuticals
1998 Cavalry Spirit Award, 2nd Squadron, 16th Calvary, U.S. Army
2006-2008 President, Kentucky Osteopathic Medical Association
2014 Distinguished Osteopathic Commitment – Brose Award
2014 Ohio Senate Award – Outstanding Attainment
2014 American Osteopathic Association – Mentor of the Year
2015 Ohio Osteopathic Association – Mentor of the Year

Data Safety and Monitoring Boards

- DSMB Chair – NIH R21 AR064430-01A1 Version 08-11-14 "Using an interactive game to reduce fear & increase spine motion in low back pain."
- DSMB - Novel exercise interventions to improve trunk muscle function: A Pilot Study/ NIAMS (R21 AR063909). Orthopaedics Program Director NIAMS, NIH, DHHS
- DSMB - Blood Donor Competence, Autonomy, and Relatedness Enhancement (Blood Donor CARE) NIH R01HL127766

C. CONTRIBUTION TO SCIENCE

- My most significant contribution to science is, arguably, the Medical Director role that I serve for both the Ohio Musculoskeletal and Neurological Institute (OMNI) and the Clinical and Translational Research Unit (CTRU) at Ohio University. In this role, I provide physician supervision to virtually all of the ongoing clinical research studies involving both OMNI and the CTRU. OMNI is a research institute at OHIO with six principal investigators and dozens of affiliated scientists. OMNI's active extramural grant portfolio is currently ~ $15M and the PI's generally publish between 25-40 peer-reviewed articles annually. The CTRU is a central support unit for all human subjects' investigations at OHIO and typically has around a dozen active IRB-approved studies operating within its management structure at any given time. Within my roles for OMNI and the CTRU I oversee all aspects of study participant care and safety as well as performance of all medical procedures (e.g., muscle biopsies). Additionally, I routinely conduct history and physical examinations of interested study participants and deliver and/or oversee treatment-based studies (e.g., trials involving drugs, manipulative therapies, devices, and lifestyle interventions). Lastly, I provide medical guidance in instances of protocol adverse events.

  a. Clark, B.C., NK Mahato, M Nakazawa, **TD Law**, and JS Thomas. The Power of the Mind: The Motor Cortex as a Critical Determinant of Muscle Strength/Weakness. Journal of Neurophysiology. 112 (12): 219-226, 2014. PMID: 25274345. *Note: This article was selected as "APSselect".*

  b. Beverly EA, Wietecha DA, Nottingham K, Rush LJ, **Law TD**. Premedical Students' Attitudes Toward Primary Care Medicine. J Am Osteopath Assoc. 2016 May 1;116(5):302-9. doi: 10.7556/jaoa.2016.060. PMID:27111783

  c. Amano S, Ludin AF, Clift R, Nakazawa M, **Law TD**, Rush LJ, Manini TM, Thomas JS, Russ DW, Clark BC.Effectiveness of blood flow restricted exercise compared with standard exercise in patients with recurrent low back pain: study protocol for a randomized controlled trial.Trials. 2016 Feb 12;17:81. doi: 10.1186/s13063-016-1214-7. PMID: 26867541

  d. Clark BC, **Law TD**, Hong SL. Editorial: "From brain to body: the impact of nervous system declines on muscle performance in aging". Front Aging Neurosci. 2015 Apr 30;7:66. doi: 10.3389/fnagi.2015.00066. No abstract available. PMID: 25983692

BUDGET AND JUSTIFICATION

Category	Item	Cost
Equipment	MRI rental and usage, 30 hours @ $250/hr	$7,500.00
	DXA Rental and Usage, 30 hours @ $66/hr	$1,980.00
	Cycling shoes, $75 x 20 participants	$1,500.00
	Subtotal	**$10,980.00**
Participant Reimbursement	Participant compensation, $300 x 30 participants	$9,000.00
	Subtotal	**$9,000.00**
Conference Travel	Lodging ($196/day x 5 days, *per diem* rate for zip code 19019)	$980.00
	Meals (first and last day per diem, $45.75/day)	$91.50
	Meals (full day per diem, $61/day x 4 days)	$244.00
	Conference Registration (student)	$275.00
	Airfare, Columbus, OH to Philadelphia, PA	$300.00
	Subtotal	**$1,890.50**
Available Equipment	Heart rate monitors	In-kind match
	Peloton stationary bicycle	In-kind match
	Metabolic cart and accessories	In-kind match
	Isokinetic/Isometric dynamometer	In-kind match
	Cycle ergometer for VO_2max testing	In-kind match
	Electrocardiogram	In-kind match
	Total Project Cost	**$21,870.50**
	Total Covered by Kopchick Fellowship Award	**$7,500.00**
	Total Covered by American Heart Association Predoctoral Fellowship	**$4,000.00**
	Total Covered by Clark Lab	**$4,000.00**
	Total Requested for Student Enhancement Award	**$6,000.00**
	Remainder from Personal Funds	**$370.50**

Timeline and Budget Justification: We have completed the first year of data collection, with 14 subjects completing all study requirements. Based on this first year we know that we can have eight participants on protocol concurrently. We will enroll the remaining 16 participants in two flights of eight each, starting in January. We expect to complete data collection by October 2020.

MRI rental and usage: Change in muscle size is a key variable in determining the effectiveness of exercise protocols. MRI is sensitive to small changes in muscle size, and accuracy of measurement is crucial, particularly in older adults where a 3% change is considered clinically relevant. I have a MRI usage agreement with the Clinical and Translational Research Unit (CTRU) at Ohio University (see appendix) and have been trained in MRI safety and scan acquisition with the device I will be using. I have negotiated a discounted price of $250/hr with the CTRU. Each participant will be scanned twice (once before and once after the 12-week exercise program), with the MRI machine being used for 30-minutes each scan ($125/30 minutes). This will result in 60 scans (30 participants x 2 scans) for a total usage time of 30 hours, and a total cost of $7,500.

DXA rental and usage: DXA provides reliable measures of fat mass. Reduced fat mass is a key indicator of exercise program efficacy, and results in improved health outcomes. I have a DXA usage agreement with the CTRU at Ohio University (see appendix) and Dr. Clark is certified in DXA scan acquisition (minor radiation exposure with the DXA requires users to have certification). I have negotiated a discounted price of $66/hr with the CTRU. Each participant will be scanned twice (once before and once after the 12-week exercise program), with the DXA machine being used for 30-minutes each scan ($33/30 minutes). This will result in 60 scans (30 participants x 2 scans) for a total usage time of 30 hours, and a total cost of $1,980.

Participant Compensation: This is a time-intensive study that will place physical demands on the participants. Individuals will be paid $60 at the completion of each of the five laboratory visits (except for those who screen fail as they will not be compensated). Thus, in total, subjects will receive up to $300 for their participation. This equates to ~ $15-30/hour for their time (including travel) and inconvenience. Individuals that withdraw from the study will be compensated through the session in which they withdraw. If someone withdraws from an intervention group they will be encouraged to still complete the post-intervention testing sessions. We do not plan to compensate individuals for participating in the exercise programs *per se*, though they will receive 12 weeks of personal training free of charge. This compensation model has been effective in previous studies performed in the Clark Lab. If 30 participants complete all five visits, they will each receive $300, for a total of $9,000.

Cycling Shoes: Participants assigned to one of the cycling protocols (n=20) will need cycling shoes for optimal performance on the stationary bicycle. These shoes have special clips that attach to the bike pedals, allowing for both quadricep and hamstring activation during cycling. Cycling shoes will not be needed for participants in the resistance training group (n=10).

Conference Travel: I will be attending and presenting at the Gerontological Society of America's (GSA) annual scientific meeting in Philadelphia, PA from November 4-8, 2020. I will fly to Philadelphia on November 3, and will stay in a hotel near the conference November 3-7 (5 days). I will attend the last day of the conference on November 8 and fly back to Columbus that evening. This will result in two travel days at 75% *per diem* for meals (November 3 and 8), and four days of full *per diem* for meals (November 4-7).

Other Equipment: Equipment listed as "In-kind match" is available in the Clark Lab, or available through the CTRU at no charge.

Additional Funding: I have received project funding from the American Heart Association, as well as the Kopchick Fellowship Award program from Ohio University. The Clark Lab has also contributed substantial funds to this project. A large portion of these funds have already been spent (~$10,000), as we are approximately halfway to our recruitment goal. The Student Enhancement Award would ensure that this project is fully funded and our recruitment goal of 30 subjects can be met, while also providing me the opportunity to present the results of this study at a large, interdisciplinary conference.

Note: All SEA funds will be used for purchases encumbered after the award date (~April 2020). I <u>will not</u> use the funds to be reimburse for expenditures incurred before that date.

APPENDIX

Confirmation of Collaboration

A. Dr. Paul Chase

Dallin - I am happy to work with and Dr. Emily Guseman to ensure that either she or I are present for each of the baseline graded exercise tests in order to oversee the ECG throughout each test.

Paul

Paul J. Chase, PhD, ACSM-RCEP, EIM-III
Assistant Clinical Professor, Exercise Physiology
Graduate Coordinator, Exercise Physiology
School of Applied Health Sciences & Wellness
Grover Center E148
740.593.4653

B. Dr. Emily Guseman

Guseman, Emily
Mon 1/14/2019 9:43 AM
To: Tavoian, Dallin

Reply

Hi Dallin,

This email serves as my confirmation that I will be available to assist with ECG interpretation for your study as needed, in cooperation with Dr. Chase.

C. Dr. Tim Law

OHIO
UNIVERSITY
Heritage College of
Osteopathic Medicine

Department of Family Medicine
Grosvenor Hall 244
Athens OH 45701-2979

T: 740.593.0465
F: 740.593.2205

Dallin Tavoian, MS, AT
PhD Candidate
Graduate Research Assistant
Ohio Musculoskeletal and Neurological Institute (OMNI)
Ohio University, Irvine 355

January 11, 2019

Subject: Student Enhancement Award

Dear Dallin:

I am writing to confirm my role as a collaborating investigator on your Student Enhancement Award application entitled "The DART Study: Exercise Strategies to Improve Physical Function in Older Adults."

My contribution to this application will be to supervise study as laid out in the approved IRB (18-F-55). I will be available by phone during the laboratory testing and the training sessions in case any adverse events occur. I have over 20 years of experience as a physician and have served as a supervising physician in several previous investigations that the OMNI lab has directed.

I look forward to working with you and serving as a collaborating investigator on this project by supervising the DART Study. Please do not hesitate to contact me, if any additional information is needed or if you have any questions.

Sincerely,

Timothy D. Law, Sr. DO, MBA

Assistant Professor of Family Medicine
Medical Director – Clinical and Translational Research Unit
Associate Medical Director Rural and Underserved Programs
COM – Family Medicine

D. Clinical and Translational Research Unit

OHIO UNIVERSITY
Heritage College of Osteopathic Medicine

July 24, 2018

Office of Research and Grants
Clinical & Translational
Research Unit
Irvine Hall 244
Athens OH 45701

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Dear Dallin Tavoian,

The Clinical & Translational Research Unit (CTRU) at the Ohio University Heritage College of Osteopathic Medicine will provide resources for you to conduct your research titled, **"Cycle high-intensity interval training to improve cardiorespiratory and muscular function in older adults."** As you know, the CTRU is a central resource to support conduct of clinical studies with human subjects. The CTRU provides support for all stages of clinical research, from initial conception to final reporting. Upon IRB approval, the CTRU has committed to providing resources for you to conduct your interventional (exercise) study with participants over the age of 65 years old.

The CTRU occupies approximately 3,000 square feet of space, primarily in Irvine Hall. The Academic Research Center adjacent to Irvine Hall houses the MRI facility with an Esaote G-Scan Brio Musculoskeletal Weight-Bearing MRI. The CTRU has multiple patient examination rooms for minor procedures such as muscle biopsies, an exercise physiology laboratory, an electrophysiology laboratory, a phlebotomy area, medication preparation and storage areas, a laboratory processing station, an intake room, rooms with specialized equipment such as a Hologic DEXA scanner, a nutrition prep station, and shower and locker storage for participants. In addition, the CTRU has dedicated parking within 40 meters of the facility, a reception and waiting area, and a 10-person conference room. Facilities for the university physician practice plan and OhioHealth O'Bleness Hospital are located within 75- and 800-meters respectively, and can provide emergency response care if needed in a rapid response manner. Dr. Law, the CTRU Medical Director, is housed within the CTRU facilities.

This letter indicates the CTRU support of the use of unit research facilities including exam rooms, patient interview space, laboratory equipment (i.e. metabolic cart and ECG), and MRI (fee based use) to advance your research. Space and equipment use are subject to scheduling availability. You have agreed to conduct your research under Good Clinical Practice and according to the CTRU standard operating procedures (SOP's) including physician oversight by the CTRU Medical Director acting as your study physician.

I look forward to working with you.

Sincerely,

Lee Ann Williams

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