



Title: Correlations between Static and Dynamic Asymmetry in Runners

Poster: 6

Presenter: Varneet Brar

Mentors: Li-Shan Chou and JJ Hannigan, Human Physiology

Major: Human Physiology

Abstract:

Asymmetry between limbs can be assessed statically, as measured by passive flexibility and range of motion (ROM), and dynamically, as measured by joint angle ROM during gait. Both types of asymmetry have been suggested as possible factors in developing a lower limb injury. The purpose of this study was to identify if there is a correlation between static and dynamic asymmetry. Sixty healthy subjects running at least 20 miles per week participated in the study. Dynamic joint angle ROM for the hip and knee was collected as subjects ran continuous laps in the UO Motion Analysis Laboratory using a 10 camera motion capture system. Static flexibility and ROM were measured by a trained clinician using a goniometer. Static and dynamic asymmetry between limbs was then calculated using an established method: the symmetry index (SI). Pearson correlation coefficients were used to test the strength of the relationships between static and dynamic SI. A moderate, significant correlation was found between static hip internal rotation ROM and dynamic hip internal rotation ROM ($r = 0.296$, $p = 0.035$). No additional significant correlations were found. As internal hip rotation has been linked to lower limb injury, future studies should investigate whether clinical correction for static asymmetry, especially for hip internal rotation, alters asymmetry during running gait. Correcting these asymmetries may help prevent injury setbacks for both recreational and competitive runners.

Title: In Vitro Angiogenesis Increases with Chronic Passive Heat Therapy:
Likely Mechanism for Improved Cardiovascular Health

Poster: 14

Presenter: Lindan Comrada

Mentors: Christopher Minson and Vienna Brunt, Human Physiology

Major: Biochemistry

Abstract:

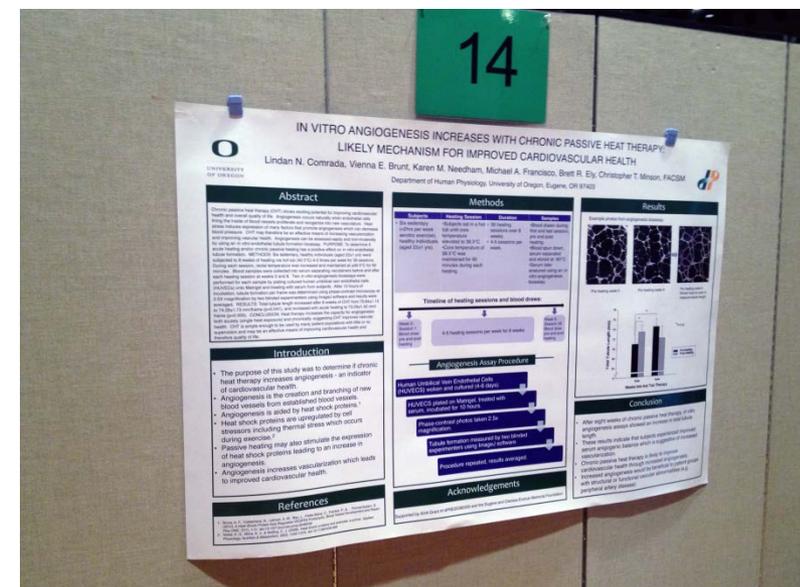
Chronic passive heat therapy (CHT) shows exciting potential for improving cardiovascular health and overall quality of life. Angiogenesis occurs naturally when endothelial cells lining the inside of blood vessels proliferate and reorganize into new vasculature. Heat stress induces expression of many factors that promote angiogenesis which can decrease blood pressure. CHT may therefore be an effective means of increasing vascularization and improving vascular health.

Angiogenesis can be assessed easily and non-invasively by using an *in vitro* endothelial tubule formation bioassay.

PURPOSE: To determine if acute heating and/or chronic passive heating has a positive effect on *in vitro* endothelial tubule formation. **METHODS:** Six sedentary, healthy individuals (aged 22 ± 1 yrs) were subjected to 8 weeks of heating via hot tub (40.5°C) 4-5 times per week for 36 sessions. During each session, rectal temperature was increased and

maintained at $\geq 38.5^\circ\text{C}$ for 60 minutes. Blood samples were collected into serum separating vacutainers before and after each heating session at weeks 0 and 8. Two *in vitro* angiogenesis bioassays were performed for each sample by plating cultured human umbilical vein endothelial cells (HUVECs) onto Matrigel and treating with serum from subjects. After 10 hours of incubation, tubule formation per frame was determined using phase-contrast microscopy at 2.5X magnification by two blinded experimenters using ImageJ software and results were averaged. **RESULTS:**

Total tubule length increased after 8 weeks of CHT from 71.7 ± 1.4 to 75.5 ± 1.6 mm/frame ($p=0.02$), and tended to increase with acute heating to 74.2 ± 1.5 mm/frame ($p=0.19$). **CONCLUSION:** Heat therapy increases the capacity for angiogenesis both acutely (single heat exposure) and chronically, suggesting CHT improves vascular health. CHT is simple enough to be used by many patient populations with little or no supervision and may be an effective means of improving cardiovascular health and therefore quality of life.



Title: Role of Endothelin Pathway in Enteric Nervous System Development and Hirschsprung Disease

Poster: 18

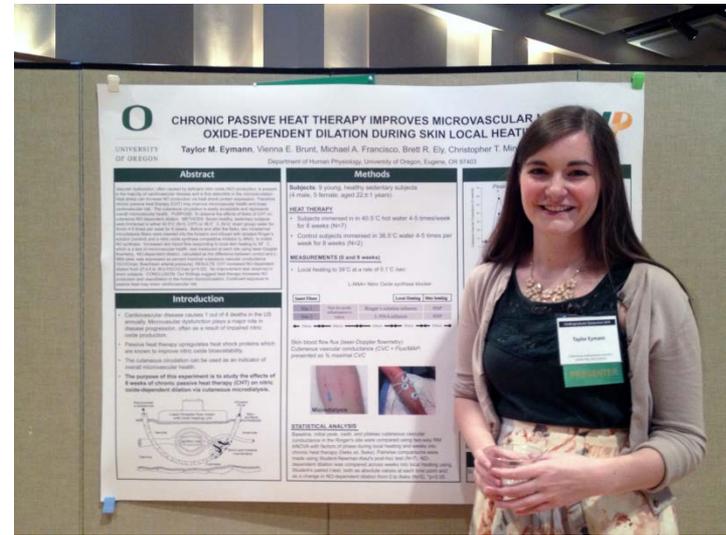
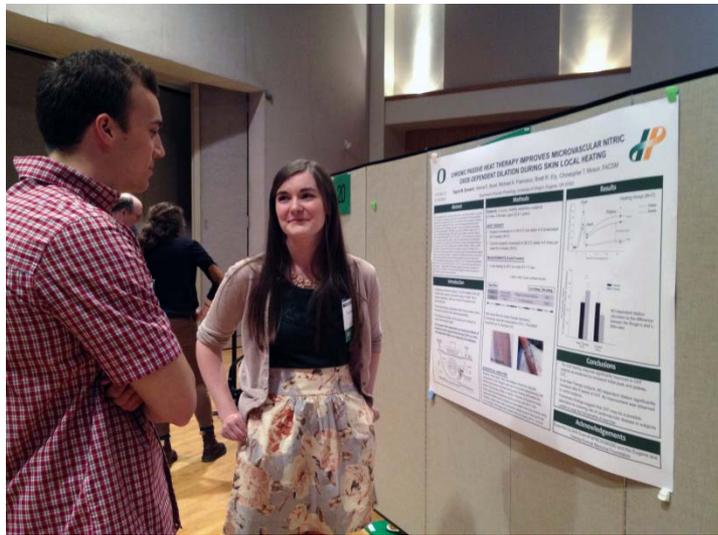
Presenter: Parham Diba

Mentors: Julia Ganz and Judith Eisen, Biology

Major: Human Physiology

Abstract:

The enteric nervous system (ENS) is the largest part of the peripheral nervous system, containing about 400–600 million neurons in humans. It comprises a complex network of neurons and glia and controls intestinal functions, such as motility. Hirschsprung disease (HSCR) is a multifactorial congenital disease in which distal intestine is uninnervated and immotile. A variety of signaling pathways, including the endothelin signaling pathway, regulate ENS development during embryonic stages. In mouse, Endothelin3 and endothelin receptor type B regulate ENS development and mutations in these genes are found in some HSCR patients. However, there are still open questions about how the endothelin pathway is involved in ENS development, such as how it affects progenitor migration and neuronal subtype differentiation. To test the role of the endothelin pathway in ENS development, we are generating zebrafish mutants in components of the endothelin pathway using CRISPR/Cas9 genome editing technology. We are currently creating zebrafish mutants in several different endothelin ligands and endothelin converting enzyme 1 and we have generated a mutant in the endothelin receptor gene *ednr^b1b*. We will then analyze the phenotypes of these mutants to learn how ENS progenitor migration and differentiation are affected. Our strategy will enable us to explore the role of endothelin signaling pathway genes in ENS development and to determine if mutations in these genes lead to an HSCR-like phenotype.



Title: Chronic Passive Heat Therapy Improves Microvascular Nitric Oxide-Dependent Dilatation during Skin Local Heating

Poster: 21

Presenter: Taylor Eymann

Mentors: Christopher Minson and Vienna Brunt, Human Physiology

Major: Human Physiology

Abstract:

Vascular dysfunction, often caused by deficient nitric oxide (NO) production, is present in the majority of cardiovascular disease and is first detectable in the microcirculation. Heat stress can increase NO production via heat shock protein expression. Therefore chronic passive heat therapy (CHT) may improve microvascular health and lower cardiovascular risk. The cutaneous circulation is easily accessible and represents overall microvascular health. **PURPOSE:** To observe the effects of 8wks of CHT on cutaneous NO-dependent dilation. **METHODS:** Seven healthy, sedentary subjects were immersed in either 40.5°C (N=5; CHT) or 36.5°C (N=2; sham group) water for 90min 4-5 times per week for 8 weeks. Before and after the 8wks, two intradermal microdialysis fibers were inserted into the forearm and infused with lactated Ringer's solution (control) and a nitric oxide synthase competitive inhibitor (L-NNA), to inhibit NO synthase. Increased skin blood flow responding to local skin heating to 39°C, which is a test of microvascular health, was measured at each site using laser-Doppler flowmetry. NO-dependent dilation, calculated as the difference between control and L-NNA sites, was expressed as percent maximal cutaneous vascular conductance (%CVCmax; flow/mean arterial pressure). **RESULTS:** CHT increased NO-dependent dilation from 27±4 to 36±5%CVCmax (p<0.05). No improvement was observed in sham subjects. **CONCLUSION:** Our findings suggest heat therapy increases NO production and vasodilation in the human microcirculation. Continued exposure to passive heat may lower cardiovascular risk.

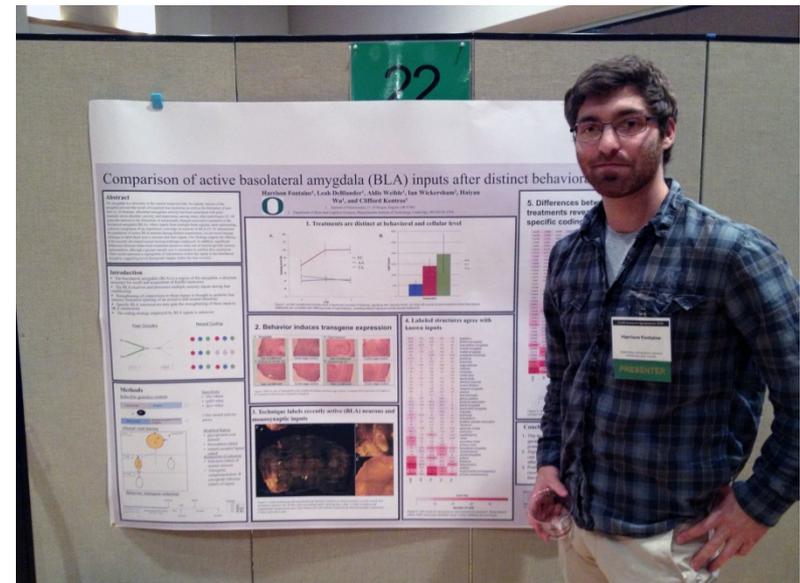
Title: Characterization of Inputs to Active Basolateral Amygdala Neurons after Different Behavioral Treatments

Poster: 22

Presenter: Harrison Fontaine

Mentors: Leah Deblande and Clifford Kentros, Institute of Neuroscience

Major: Biology and Human Physiology



Abstract:

The amygdala is a brain structure that is required for the acquisition and storage of fearful memories. In humans, abnormal amygdalar activity has been associated with post-traumatic stress disorder, anxiety, and depression. One component of simple fear memory formation is the association of a fearful stimulus and an otherwise neutral predictive stimulus. This association occurs in the basolateral amygdala (BLA). While the main inputs to the BLA are well characterized, the specific coding strategies these inputs use to convey information has not been detailed. We used transgenic mice in conjunction with a modified viral tracer to determine how the inputs to recently active BLA neurons varied after exposure to fear-inducing and non-fear-inducing situations, with the reasoning that if different inputs were labeled after different treatments, inputs must be employing a neuron-specific coding strategy. In addition, we examined the differential activity of neurons in the BLA that may be gating the formation of fear memories. We reasoned that if these neurons were differentially active between fear-inducing and non-fear-inducing situations, these neurons might indeed be gating fear memory formation. Our results supported the use of a neuronspecific coding strategy in BLA input regions, as well as the model of a subset of BLA neurons gating fear memory formation. These results elucidate aspects of fear memory circuitry, and thus have implications in treating fear circuit pathologies.

Title: Who Was Chief Paulina? Restoration History and the Reconstruction of Paulina's Identity in Popular Memory

Poster: 28

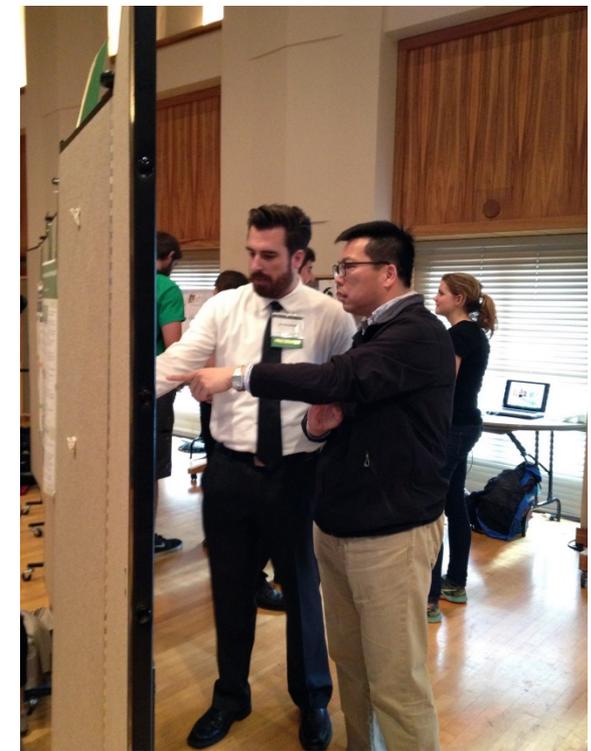
Presenter: Sarianne Harris

Mentors: Kevin Hatfield, History; Jennifer O'Neal, Special Collections

Major: Human Physiology

Abstract:

This paper examines the life of Chief Paulina, a Northern Paiute of the *Hunipuitoka* band, beginning at the time of major conflicts caused by the creation of the Warm Springs Reservation within Central Oregon in 1855 and ending around the time of his death in 1867. Chief Paulina, throughout his life and in popular memory, has been demonized and distorted into a bullet-proof, blood-thirsty, violent war leader who cared for little but the thrill of raiding. I argue that Chief Paulina was, instead, a skilled leader who cared for his people and fought bitterly to protect his homeland. He made necessary decisions, based on the information and resources he had at his disposal, to care for his people and keep their land. I utilize secondary, but focus on primary, resources as I examine the Northern Paiute view of the Warm Springs Reservation, interactions between Chief Paulina and Captain Kelly of Fort Klamath, and Chief Paulina's behavior regarding the capture of his people. These areas of focus reveal a more complete view of the person behind the legend than the portrayals of Chief Paulina found in history books, Oregon museums, and local histories.



Title: The Effect of Chronic Passive Heat Therapy on Forearm Reactive Hyperemia
Poster: 31
Presenter: Andrew Jeckell
Mentors: Christopher Minson and Vienna Brunt, Human Physiology
Major: Post-baccalaureate

Abstract:

Reactive hyperemia is a transient increase in blood flow that occurs following a period of ischemia (e.g. arterial occlusion) and is indicative of microvascular health. Regular exercise is a critical preventive measure in maintaining reactive hyperemia; however, consistent exercise is difficult or impossible for some people. Recent evidence suggests chronic passive heat therapy (CHT) may result in improvements to cardiovascular health similar to exercise. To examine the effects of 8 weeks of CHT on forearm post-occlusive reactive hyperemia, six healthy university students (21 ± 1 years) underwent hot water immersion 4-5 times per week to maintained rectal temperature of 38.5°C for 1 hour per session. Before and after 8 weeks of CHT, brachial artery blood flow was measured via Doppler ultrasonography for 3 minutes following a 5-minute forearm arterial occlusion. Data presented as mean \pm SE vascular conductance (VC, blood flow divided by mean arterial pressure). In preliminary subjects, change in peak VC from baseline, indicating structural microvascular changes, increased following CHT from 1.77 ± 0.24 to 2.26 ± 0.20 ml/min/mmHg ($p = 0.09$). Area-under-the-curve of the hyperemic response, indicating functional changes, increased from 59.7 ± 9.0 to 111.9 ± 13.0 sec.ml/min/mmHg ($p = 0.11$). CHT appears to produce structural and functional microvasculature changes comparable to that of exercise, and could potentially serve as an alternative method for improving cardiovascular health.

Title: Changes in Walking While Using a Smartphone
Oral Presentation
Presenter: Taylor Kay
Mentor: Li-Shan Chou, Human Physiology
Major: Human Physiology



Abstract:

It is common to see people using a phone while walking on campus. Our research analyzed gait in walking and crossing an obstacle while performing a visual cognitive test on a smartphone. Ten young healthy adults (5 males and 5 females, age: 21.5 ± 2.07 years) randomly accomplished the following five tasks: 1) Gait only: walking at selfselected speed, 2) Gait + Stroop: walking while answering a Stroop test app (EncephalApp) on an iPod touch, 3) OBS only: walking over an obstacle set at a 10% of the subject's height, 4) OBS + Stroop: crossing an obstacle while answering a Stroop test app, 5) Stroop only: sitting while answering a Stroop test app. A 10-camera motion capture system (Motion Analysis Corp., Santa Rosa, CA) was used for data collection and Cortex software (Motion Analysis Corp., Santa Rosa, CA) was used for processing the data. Our data suggested that individuals walked slower, swayed more, and raised their legs higher while using a smartphone during walking or obstacle crossing. These altered gait behaviors can lead to higher risks to pedestrian safety.

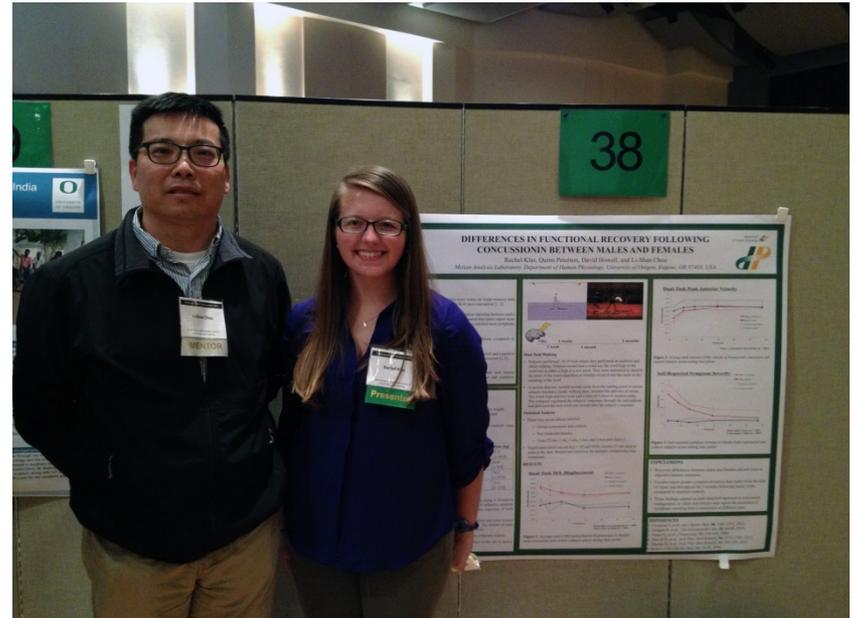
Title: Differences in Functional Recovery Following Concussion between Males and Females

Poster: 38

Presenter: Rachel Klas

Mentors: Li-Shan Chou and Quinn Peterson, Human Physiology

Major: Human Physiology



Abstract:

Concussion, a brain trauma resulted from linear or rotational acceleration to the head, represents a majority of the traumatic brain injuries (TBI) sustained each year. To understand if there are recovery differences between males and females post-concussion, this research examined males and females with matched controls for two months following the injury. In this study, a 3-dimensional motion analysis system was used to observe the trajectory of 29 anatomical locations in order to determine the peak anterior velocity of each subject's center of mass (COM, the point where the mass is equally distributed) and the medial-lateral COM sway. Symptom severity was assessed based on a 22-symptom inventory and a scale similar to the Likert scale for each symptom (ranking each symptom from 0-6). A three-way analysis of variance, or ANOVA, was performed to analyze the data in order to determine the effect of concussion, sex (male and female), time (72 hour, one week, two week, one month, and two month post-injury), and the interactions between these independent variables. It was revealed that males and females do not objectively differ in terms of the peak anterior COM velocity or COM medial-lateral displacement across the 2-month study, but that females reported more severe symptoms than males. The findings suggest that subjects of both sexes follow the same general gait balance recovery trends and that both sexes report heightened symptoms for at least two months after experiencing a concussion. Across all time points, females reported more symptoms than males, so either males are underreporting their symptoms or females are experiencing more symptoms than males.

Title: Effects of Chronic Passive Heating on Resting Heart Rate, Blood Pressure, and Body Core Temperature

Poster: 44

Presenter: Kaitlin Livingston

Mentors: Christopher Minson and Vienna Brunt, Human Physiology

Major: Human Physiology

Abstract:

Repeated bouts of exercise in the heat are known to decrease resting body core temperature (T_c), mean arterial pressure (MAP) and resting heart rate (HR). Although exercise in the heat produces these cardiovascular changes, it is currently unknown whether passive chronic heating provides the same benefits. Our research sought to examine the effects of passive chronic heating on resting T_c, MAP, and HR. Five sedentary, college-aged subjects (4 females, 1 male) were assigned to an 8-week hot water immersion program (4-5 sessions/week). Subjects were submerged to the clavicle in 40.5°C water until a rectal temperature (T_{re}) of 38.5°C was reached. Subjects maintained a T_{re} between 38.5-39.0°C during an hour of partial immersion. HR and T_{re} were measured with a HR monitor and rectal thermistor both at rest and at 5-minute intervals during the heat stress. MAP was measured on another day with **brachial auscultation after ≥20 minutes of supine rest. Both resting MAP (81±1 vs. 76±2 mmHg, p=0.02)** and resting T_{re} (37.4±0.5 vs. 36.8±0.4°C, p=0.03) decreased after 8 weeks of passive heat stress with no change in resting HR (63±5 vs. 63±6 beats/min, p=0.26). Chronic passive heat stress reduces resting MAP and T_{re} similarly to what is observed with exercise heat in the heat. This suggests that chronic passive heat stress could be used to benefit cardiovascular health similarly to exercise in the heat.

Title: Temporal Variation in Atmospheric Fungal Community Composition and Diversity

Oral Presentation

Presenter: Kyla Martichuski

Mentors: Jessica Green and Ann Womack, Biology

Majors: Biology and Human Physiology

Abstract:

Characterizing the different types of fungi in the atmosphere and their abundance is of great importance when considering atmospheric processes and dispersal of organisms. Current research suggests that fungi can alter precipitation patterns by promoting the formation of ice crystals at warmer temperatures than the freezing point of pure water. Studying the flow of microbes from one place to another is particularly important because agricultural and human fungal pathogens are transported in the atmosphere. The purpose of my research is to measure the composition, diversity, and temporal patterns of fungal communities in the atmosphere in order to provide a better understanding about the dispersal patterns of fungal types. I am using advanced culture-independent, highthroughput DNA sequencing techniques to analyze fungal community composition in air samples collected at the Mt. Bachelor Observatory, a high-elevation research station. Previous research suggests that bacterial community composition on the summit of Mt. Bachelor varies diurnally and community diversity changes significantly across days, and these patterns could be similar in fungal communities. Diurnal variation is likely due to the influence of local sources on community assembly whereas variation across many days could be due to the influence of long distance sources. Understanding the dispersal patterns of fungi from source environments could provide insight about the importance of dispersal related to agricultural and human pathogens.

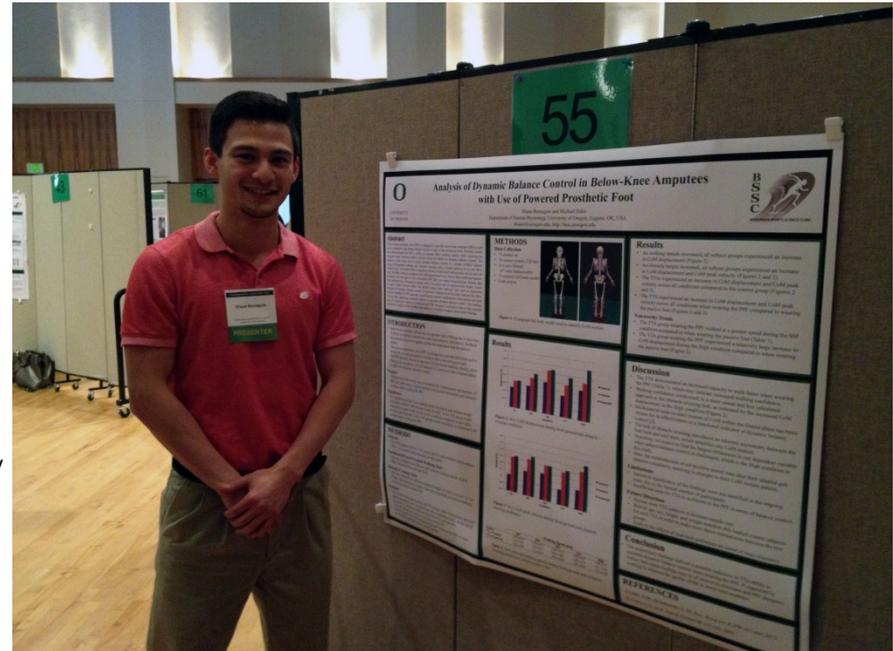
Title: Analysis of Dynamic Balance Control in Below-Knee Amputees with Use of Powered Prosthetic Foot

Poster: 55

Presenter: Shaun Resseguie

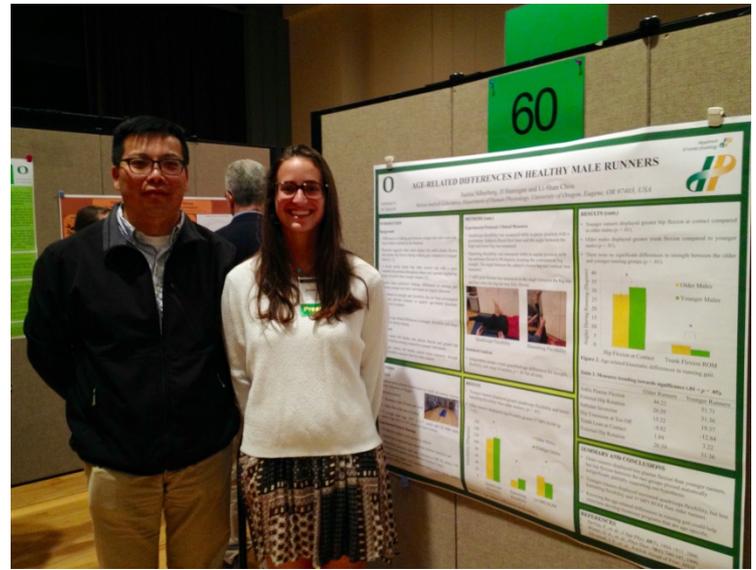
Mentors: Michael Hahn and Jake Hinkel-Lipsker, Human Physiology

Major: Human Physiology



Abstract:

The powered prosthetic foot (PPF) is designed to provide below-knee amputees (BKA) with active propulsion and plantar flexion similar to that of the biological limb. Previous studies have demonstrated the PPF's ability to increase BKA walking speeds, while reducing the energetic costs, however, little is known about its effects on dynamic balance control. The purpose of this study was to assess dynamic balance control in a sample of BKA subjects during level-ground walking and obstacle crossing tasks. Control subjects ($n=5$) and BKA subjects ($n=4$) were instructed to complete a series of functional walking tasks during each lab visit. The BKA subjects completed the walking protocol twice, first in their traditional passive prosthetic foot and again in the prescribed PPF after two weeks of acclimation. Motion data were collected via a 10-camera system with a 53-marker and 15-segment body model. Center of mass (CoM) motion and peak velocity within the frontal plane were analyzed and used as functional indicators of dynamic balance control. Preliminary findings from the study indicate that BKA subjects wearing the PPF generally experienced a greater mediolateral CoM motion and peak velocity, thus signifying a reduced ability to maintain dynamic balance control. Our findings may be of particular interest to clinicians and PPF designers working to improve the amputee population's quality of life. Further data analysis is needed to support these initial findings.



Title: Age-Related Differences in Healthy Male Runners

Poster: 60

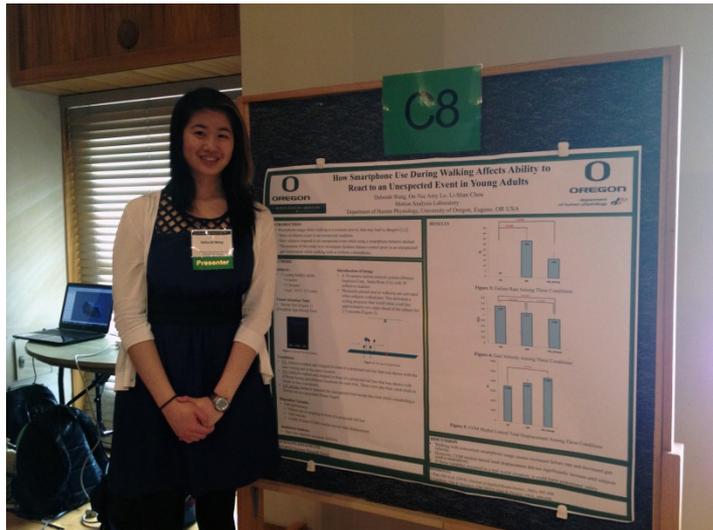
Presenter: Justine Silberberg

Mentors: JJ Hannigan and Li-Shan Chou, Human Physiology

Major: Human Physiology

Abstract:

Previous research suggests that older males display less ankle plantar flexion and greater hip flexion during gait compared to younger individuals. Differences in running gait between younger and older individuals, however, are largely unknown. This study investigated differences in strength, flexibility, and range of motion between younger runners ($n = 15$; age range = 18-21) and older runners ($n = 10$; age range = 40-51). All subjects were males who ran at least 20 miles per week. For testing, subjects ran continuous laps of approximately 40-meters in the Motion Analysis Laboratory. Running kinematics were collected using a 10-camera motion capture system, strength was measured using a Biodex System 3 dynamometer, and flexibility was measured statically by a trained clinician. Independent sample t-tests were used to examine group differences. Older individuals were found to have increased hamstring flexibility, increased first metatarsal-phalangeal joint range of motion, decreased quadriceps flexibility, and decreased trunk flexion compared to younger runners ($p < 0.01$). Limitations include the relatively small sample size and cross-sectional nature of this study. Understanding age-related differences in running gait may help clinicians better treat injuries in older runners. Future studies exploring age-related differences in running should recruit a wider age range and follow these individuals over time.



Title: How Smartphone Use during Walking Affects Ability to React to an Unexpected Event in Young Adults

Poster: C8

Presenter: Deborah Wang

Mentors: Li-Shan Chou and On-Yee Lo, Human Physiology

Major: Human Physiology

Abstract:

College students often engage in risky mobile phone behaviors. Though texting while driving has been an extensively studied, the issue of texting or other smartphone usage while walking has only been recently examined as a daily hazard. This project focused on how smartphone usage affected a person's response to an unexpected event when the subject was looking intently at the screen. This study examined the failure rate as the subject stopped in front of a projected line, and associated gait characteristics including stride length, center of mass (COM) velocity and COM medial-lateral sway. In this experiment, whole body motion was collected with 29 reflective bony landmark markers and a 10-camera system. Subjects first stopped in front of a projected line at the same location, and with the same timing for 5 trials (expected condition, EX). Subjects were then asked to stop in front of the line projected at different times or locations for 10 trials (unexpected condition, UN), and then simultaneously completing a Stroop test on an iPod touch under the same unexpected condition for another 10 trials (UN_Stroop). A Stroop test has subjects pick the ink color a word of a color (IE green, blue or red) is written in (IE green, blue or red). This made the UN_Stroop condition the most challenging. UN and UN_Stroop had a higher failure rate than the 0% of EX (33% and 17% respectively). Furthermore, with smartphone usage, gait velocity and stride length decreased while medial-lateral sway increased, which could negatively impact pedestrian safety.