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## **"Current Treatment Guidelines Affirm the Importance of Regular Physical Activity in Preventing and Treating Type 2 Diabetes (T2D).**

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## **Faculty or Research Mentor**

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RCEU History: I have no previous RCEU history.

## **Project Summary**

Current treatment guidelines affirm the importance of regular physical activity in preventing and treating Type 2 diabetes (T2D). Lifestyle intervention programs for persons with T2D typically incorporate aerobic training, given the positive therapeutic effects of endurance exercise in reducing body weight and improving whole-body insulin sensitivity. However, factors such as muscle weakness and diminished exercise tolerance can lessen participation in and adherence to aerobic-type activities among individuals with T2D. Interventions featuring resistance-type exercise have also been shown to lower glycosylated hemoglobin, enhance insulin sensitivity, and improve skeletal muscle mass in T2D. Moreover, gains in muscle strength in the diabetic population enable activities of daily living to be accomplished with less relative physical strain.

While these findings provide support for persons with T2D to regularly engage in exercise, participation can be difficult to sustain, especially among individuals who are relatively sedentary, overweight, display low exercise capacity, or experience musculoskeletal pain while being physically active. Hence, a clinical need exists to test new strategies to optimize the health-producing benefits of physical activity for persons with T2D which incorporate a both endurance and resistance exercise, while enhancing program compliance and minimizing the risk of health complications. Against this backdrop, our primary goal in conducting this project is to quantify the therapeutic and functional benefits of a 12-week, aquatics-based, treadmill walking program in adults with T2D. Furthermore, the program will incorporate a systematic decrease in water height throughout the duration of the study. We will analyze the effect of an underwater treadmill walking program on glycemic control, body composition, muscular strength, balance, and coordination amongst adults with T2D.

Female and minority students are encouraged to apply.

## **Student Prerequisites**

No course work prerequisites are needed but the individual should be in either junior-or-senior level standing.

## **Student duties**

The student will be expected to work closely with faculty mentor to perform following duties in the exercise physiology laboratory:

- Creating and distributing participant recruitment flyers and emails

- Measuring and analyzing pre-and-post outcome measures such as: glycemic control, body composition, muscular strength, balance, and coordination
- Preparation, cleaning, and sanitation of the underwater treadmill
- Conducting both accommodation and exercise walking sessions in the underwater treadmill

The student will be expected to work closely with faculty mentor to perform following duties in the UAH Autonomous Tracking Optical Measurement (ATOM) lab:

- Measuring the kinematics of walking and daily activities using the motion capture capabilities of the ATOM lab
- Utilizing the Vicon Bodybuilder software to analyze the aforementioned output

Main benefits to the students are

- Unique opportunity to use state-of-the-art experimental and numerical tools, such as:
  - Underwater treadmill
  - Motion tracking system in the ATOM lab
  - Simulation tool to model and analyze human movements
- Opportunity to perform exercise testing and assessment in adults with T2D
- Opportunity to contribute to a journal paper or conference presentation, depending on the progress of the study

Recruitment for this study will begin in the later portion of the spring 2017 semester. All pre-intervention baseline measurements and underwater treadmill training sessions are expected to begin at the start of the summer 2017 semester. Training sessions will occur throughout the summer and into the beginning of the fall semester.

### **Mentor Supervision and Interaction**

The faculty mentor will provide the daily supervision to the student. In addition, the student is expected to update the mentor with a weekly progress report and during bi-weekly meetings. The followings are the specifics.

- Weekly progress update report
  - Written together with the graduate student
  - To discuss recruitment efforts, aquatic exercise physiology, collected data, any issues, and plans for the following week
  - Evaluation: the mentor will provide feedback to all reports. The mentor will assess and provide feedback on the writing, scientific progress, and quality of the analysis.
- Bi-weekly progress update meetings with the student will cover:
  - The results and any issues that have taken place.
  - Frequency of the meeting will be increased as needed throughout the summer.
  - Evaluation: the mentor will provide detailed instruction for the on-going work and offer suggestions for improvement.