

# The Effect of an Underwater Treadmill on HbA1c Levels in Lower Limb Amputees with Diabetes

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## Background

Diabetes mellitus is one of the leading causes of lower extremity amputation in the United States. Previous research has showed that involvement in regular aerobic and resistance exercise lowers glycosylated hemoglobin (HbA1c) levels in individuals with diabetes. Underwater treadmill training allows for group of individuals with special exercise considerations (severely overweight, obese, amputees, and those with limited mobility) to exercise safely.

## Purpose

The purpose of this study is to examine the effects of an underwater treadmill training (UTT) protocol on HbA1c levels in unilateral, transtibial amputees with diabetes. The primary measure for long-term glycemic control is HbA1c, a measure of average blood glucose and a common biomarker for diabetes.

## Methods

Baseline measures of HbA1c, body mass index (BMI), and cardiorespiratory function measurements will be obtained one week before the start of UTT. Pre and post training glycemic measurements will also be analyzed from a 1uL blood sample drawn from a finger prick. Resting heart rate (RHR) will also be measured and is determined from palpation of the radial pulse for 30 seconds, and the obtained HR doubled to obtain beats per minute. Duplicate measures of RHR will be obtained within a 5 minute period and the average for each individual will be calculated. The UTT protocol will begin with participants walking at 2 mph. Speed will be increased gradually until a HR of 50-70% of estimated maximal heart rate (220-age) is met.



## Know Your A1c!

The blood test with a memory



## Participant Characteristics

In order to determine potential confounding factors that may influence rehabilitation success and program adherence, depression and PTSD were measured. Depressive symptoms were measured with the 9-item Patient Health Questionnaire (PHQ-9), which is a self-administered depression scale. The PHQ-9 has a short administration time, has been shown to be a valid, and is a reliable measure for depression severity. The PTSD Checklist-Civilian (PCL) is a 17-item scale measuring symptoms of PTSD on a 5-point frequency scale. The PCL has a short administration time, high test-retest reliability, internal consistency, convergent validity, and discriminate validity.

**Exercise Intervention.** Participants will complete three UTT sessions per week for a total of six weeks. Training sessions will be performed on alternate days. All training sessions will entail three bouts of exercise separated by 5 minutes of seated rest. Heart rate will be monitored continuously during training and will be recorded before, at the midpoint, and at the conclusion of the session. Walking speed and duration will be increased in a structured and gradual manner. Participants' residual limb will be visually inspected before and after each training session for signs of skin irritation.



## Preliminary Results

One participant has been recruited. This participant completed the PHQ-9 and PCL. There is no indication of depression or PTSD.

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