

The Effect of an Underwater Treadmill Aquatic Exercise Program on the Functional Ability of K2, Trans-Tibial, Unilateral Amputees

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Introduction

Physical activity is known to improve health through the prevention of cardiovascular and metabolic diseases. At this time, 54% of lower limb amputations are due to vascular dysfunction with a co-morbidity of diabetes. Many patients with an amputation due to diabetes will require an amputation of the second leg within two to three years. In order to prevent amputation of the second leg, amputees must first be able to engage in regular physical activity.

To do this, it is first necessary to boost an amputee from a Medicare Functional Activity Level of K2 to a K3. With this, third party insurance providers will supply a better prosthetic device that will improve mobility. Exercise protocols are needed to strengthen a participant's muscles and improve their speed while ambulating on a dry-land environment. As a result of becoming a K3, an individual will have access to better prosthetic componentry that will aid them in traversing multiple environments and allow them to engage in a healthier lifestyle.

Table 1
UTT intensities and durations throughout the study

1st Cycle: Weeks 1-3	2nd Cycle: Weeks 4-6	3rd Cycle: Weeks 7-8
3 Exercise Bouts at 40-50% of HRR	3 Exercise Bouts at 50-60% of HRR	3 Exercise Bouts at 50-70% of HRR
Week 1: 10 min each	Week 4: 14 min each	Week 7: 16 min each
Week 2: 12 min each	Week 5: 16 min each	Week 8: 16 min each
Week 3: 14 min each	Week 6: 16 min each	*Rest 5 min between each bout

Materials and Methods

Participants were unilateral, transtibial amputees with K2 activity level status. Only established amputees were included, which means the amputation must have occurred at least six months prior to the start of the study. The amputees performed their training in a self contained underwater treadmill unit. The exercise protocol consisted of an 8-week aquatic intervention program. There were three exercise sessions a week, making a total of 24 aquatic exercise sessions. All participants underwent the aquatic exercise intervention program, completed psychosocial questionnaires, and will be evaluated by a licensed prosthetist at the end of the study. Exercise intensity was measured by heart rate reserve (HRR).

Key Findings/Results

Due to the duration of the study, data collection is still ongoing. However, some of the feedback has proven that gait continues to improve amongst the participants in the study. Both the duration and intensity of exercise has been gradually increased over time. One of the participants has been moved from a K2 to a K3 level functional ability status. In addition to quantitative improvement, one participant also mentioned that "the pressure of the water helps my prosthetic leg feel more like a normal leg than a prosthetic device".

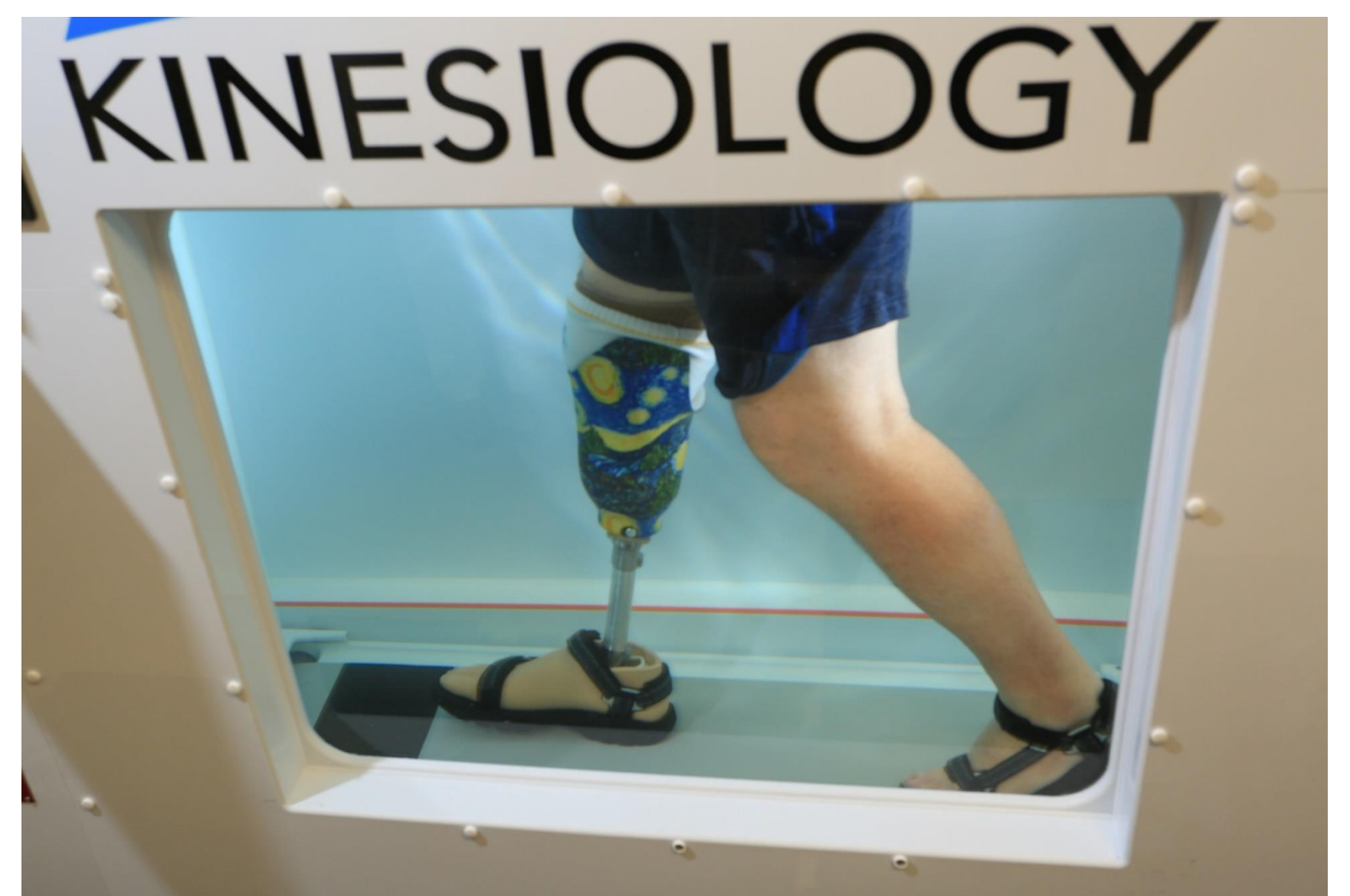


Figure 1
Participant performing an underwater treadmill walking bout

Impact/Conclusions

Underwater treadmill training can lead to improved gait and lower leg strength in lower leg amputees. As a result, adults with lower leg amputations will have a decreased number of falls and improved quality of life. In conclusion, the use of a unique underwater treadmill training program provides the combination of aerobic and resistance training that can be a successful exercise environment for improvements in health-related fitness.

References

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Acknowledgements

I would like to thank Dr. Conners, Dr. Vogler, David Cook, Fourroux Prosthetics, UAH Office of the Provost, UAH Office of the Vice President for Research and Economic Development, and the Alabama Space Grant Consortium for making this research possible.