

Increasing physical activity in diabetic adults via aquatic treadmill and strength exercises

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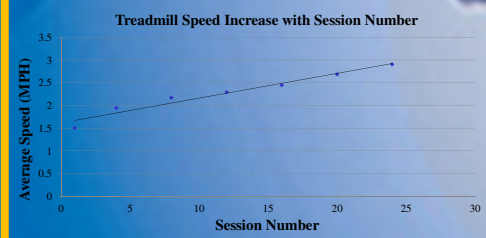
ABSTRACT

Background: Previous research in aquatic exercise has shown joint stress to be reduced due to the buoyancy and thermal properties of water. This should improve exercise enjoyment and compliance in overweight individuals and those with joint pain. Since there is a high correlation between diabetes and obesity, and exercise is imperative for limiting the adverse effects of diabetes, there is a need to find exercise modes that will motivate diabetics to start and continue in regular physical activity.

Methods: Informed of the study by their family physician at a regular office checkup, 40 subjects, 64± 10 years of age, went through a detailed consent process with a research nurse. Most subjects were sedentary, overweight, and type II diabetic. Our goal was two 30-minute sessions per week for 12 weeks on a Hydroworx™ underwater treadmill kept at 33°C. Pre- and post-training assessment included height, weight, skinfolds, waist and hip girth, and a survey of energy levels, ADLs, and sleep quality. Clinical variables pre- and post-training included blood pressure, cholesterol, and HbA1C. **Results:** Of the 40 consented subjects, 35 began the training and 29 (73%) continued beyond two sessions, completing 83% of the available sessions. Pre- and post-training data have been collected on 25 (63%). Though data analysis continues, results have shown modest weight loss, increased workload at a given RPE based on treadmill speed and jet flow, and an increased peak effort. Survey responses and verbal feedback demonstrate increased energy, better sleep, improved ADLs, and enthusiastic appreciation for this mode of exercise. **Conclusions:** The less than 100% "success rate" confirms how challenging it can be to motivate sedentary, diabetic individuals to exercise even in a warm, low stress environment. However, those who did participate have expressed an improvement in daily physical function as well as a desire to continue to be physically active.

AIM

The aim of this present study is to determine if 24 sessions of underwater treadmill exercise is effective and motivating for individuals with diabetes to engage in regular and continuous physical activity.



EXERCISE PROTOCOL TABLE

Component	Time	Action
Warm-up	0:00-1:00	Walk Forward
	1:01-2:00	Walk Backward
	2:01-3:00	Side Step
	3:01-4:00	Karaoke
	4:01-5:00	High Knees
Aerobic	5:01 - 20:00	Walk or Jog
	20:01 - 22:00	Hip Abduction / Adduction
Strength	22:01 - 24:00	Hip Flexion / Extension
	24:01-26:00	Bicep Curls / Chest Flies
	26:01-28:00	Frontal / Lateral Raises
Cool-down	28:01- 30:00	Hydro-massage / Stretch

INTRODUCTION

- ◆ An aquatic environment has been shown to decrease impact on joints during exercise because of buoyancy, thermal properties, and pressure. The warm water temperature (33°C) provides a comfortable environment that allows the participants freedom and enjoyment of movement that they are unable to experience on land.
- ◆ Since diabetes is often accompanied by obesity, an exercise mode is necessary for overweight individuals that encourages adherence and thus decreases the adverse effects of diabetes.
- ◆ Possible health improvements predicted include:
 - ◆ Body composition
 - ◆ Balance
 - ◆ Strength
 - ◆ Aerobic capacity
 - ◆ Energy levels
 - ◆ Sleep quality



METHODS

- Subjects**
- ◆ N=40 Caucasian adults consented. Pre- and post-data collected on 25 (13 male, 12 female, age range 45-82)
 - ◆ Subjects were either pre-diabetic, type I, or type II diabetic, with a majority being type II diabetic.
 - ◆ Other risk factors included obesity and sedentary lifestyle.
- Procedures**
- ◆ An initial screening of blood pressure, HbA1C, and LDL cholesterol was performed at their most recent regular doctor's office visit.
 - ◆ Baseline assessments included height, weight, skinfold sites (Men: chest, tricep, subscapula, thigh, abdomen. Women: tricep, suprailiac, abdomen, thigh), waist and hip circumferences, and survey questions.
 - ◆ A planned 12-week study in which subjects exercised 30 minutes, two times per week.
 - ◆ Subjects exercised either alone or in pairs at mid-chest water depth with two researchers instructing protocol.
 - ◆ Refer to exercise protocol table for full program design.
 - ◆ Intensity was modified based on individual exercise capacity and motivation (e.g. increased jet flow, treadmill speed, resistive equipment).
 - ◆ Post-testing was same as baseline assessment.

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Variable	Pre-Training	Post-Training
Weight (lbs)	223	219
Waist Girth (cm)	111	109
Hip Girth (cm)	118	117
Waist to Hip Ratio	.95	.94
Energy Levels (1-10)	5.2	7.6
Sleep Quality (1-10)	7.4	8.2
Activities of Daily Living (1-10)	6.6	7.2
Work Related Activities (1-10)	6.6	8.1
Recreational Activities (1-10)	6.0	7.4
Speed (mph)	1.5	2.6
Jet flow (%)	15	32

Note: All values are average pre- and post-training for n=25.

RESULTS

- ◆ 29 of the 40 subjects (73%) completed a majority of the planned training sessions.
- ◆ Those 29 subjects attended 83% of the available sessions.
- ◆ Results have shown modest weight loss, increased workload at a given RPE, and peak effort.
- ◆ Survey responses and verbal feedback have demonstrated increased energy, better sleep, improved ADLs, and enthusiastic appreciation for this mode of exercise.
 - ◆ "I have more endurance during the day and feel great!"
 - ◆ "I can now walk more often without having to use my walker."
 - ◆ "This has inspired me to join Gold's Gym and I now work out 3-4 times a week."
 - ◆ "I now feel more confident exercising on my own."

SUMMARY AND CONCLUSIONS

- ◆ Improvements in overall physical function and aerobic endurance were observed throughout most participants' 12 weeks of exercise. Verbal communication and post-test surveys from most subjects reported positive effects in energy levels, improved ADL's and quality of sleep.
- ◆ We conclude that exercise in a warm, underwater treadmill is effective at improving physical function and helping an individual transition from a sedentary to a more physically active lifestyle.