

Introduction to Underwater Aquatic Fitness

Underwater Yoga Journal – Fall 2010



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Rutgers Recreation

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Aquatic Fitness

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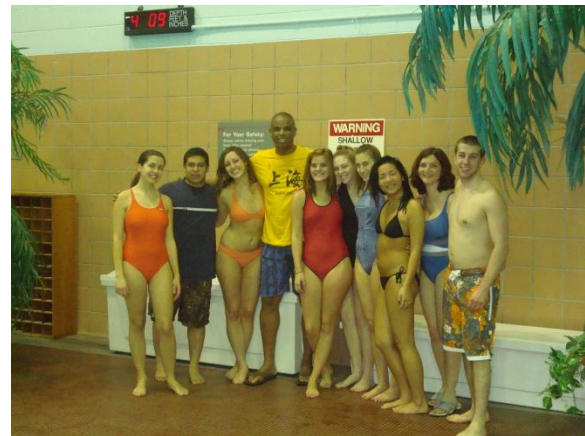
Underwater aquatic fitness is the newest branch of aquatic exercise. This paper will document what underwater aquatic fitness is, the benefits it provides and suggestions for future research.

Underwater Fitness was first established at Rutgers University in January 2010 in the recreation department with a class called Underwater Yoga. In this class, traditional yoga postures are done in shallow water (i.e. 4-foot) using scuba equipment which allows participants to do postures below the surface of the water and on the pool floor (e.g. downward dog) without the need to hold their breath.

This class not only does underwater yoga postures, but also warm-up, stretching, aerobic exercise, cardio exercise, and meditation all performed underwater. Since the class also contains a similar warm-up, stretching and yoga routine on the pool deck prior to entry into the pool it was called Underwater Yoga.

Clearly, Underwater Yoga could be replaced with underwater aerobic dance, underwater step and even underwater spinning. Almost

every type of exercise class that can be performed on land, can now be performed underwater



The first Underwater Yoga class ever taught at a University. Pictured from Left to Right: Jennifer Marcketta, Michael Abourched, Katie Lawnik, Andrew Oliver, Evangelina Pena, Carly Conroy, Erin Buckley, Jessica Lin, Galina Bolden, Matthew Allinder. Not Pictured: Caitlin Ferrer, Jane Kiernan, Nicolette Waksmundzki

The current modes of aquatic exercise

The AEA (i.e. Aquatic Exercise Association) currently documents two types of aquatic

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exercise. The first type is Shallow-Water Exercise. These exercises are done in water no higher than a person's arm pits (around four-foot six-inches). The second type is Deep-Water Exercise. These exercises are done in water too deep to stand in and require participants to wear flotation equipment to keep their head above water.

We believe that Underwater-Exercise is the third and final inclusion into the world of aquatic fitness since it includes all the remaining possible aquatic exercise options. Underwater Exercise would have two possible modes.

The first mode is Underwater Shallow-Water Exercise that would mirror the requirements of the AEA's Shallow-Water Exercise. This would be performed in arm-pit high water. Underwater exercise in shallow water eliminates many safety concerns related to scuba training. Participants don't need to know how to swim or do scuba (since all they will essentially do is breath on the regulator).

With the exception of learning how to equalize the mask, there are no scuba diving related skills needed to learn and the focus is squarely on the aquatic exercise. Any concerns in an underwater Shallow-water exercise class can be resolved by just standing up.

The second mode is Underwater Deep-Water Exercise that would mirror the requirements for the AEA's Deep-Water Exercise except now the participant can also do exercises on the bottom to the pool. It would be performed in water too deep to stand in but no deeper than twenty feet in depth.

Because of the depth involved, this Underwater Deep-Water Exercise requires scuba diver certification. Because it requires scuba certification to participate, we consider it beyond the scope of the aquatic exercise curriculum at this time. The focus of the remainder of this paper is only concerning Underwater Shallow-Water Exercise.

The Four Types of Aquatic Exercise

Exercise Mode	Depth	Special Equipment	Ability to Swim	Scuba Certification
Shallow-Water	4'-6" or armpit deep	None	No	No
Underwater Shallow	4'-6" or armpit deep	Mask, BCD, Tank, Regulator	No	No
Deep-Water	Too Deep to stand with a 20' maximum	Flotation device	Yes	No
Underwater Deep ¹	Too Deep to stand with a 20' maximum	Mask, BCD, Tank, Regulator	Yes	Yes

¹ Because Underwater Deep-Water exercises are performed at depths which require scuba certification, it will not be considered as part of the Aquatic Fitness options describe in this journal.

Guidelines for Conducting Underwater Aquatic Exercise Classes

At Rutgers University we conduct an Underwater Yoga class which incorporates a wide variety of exercise options. Below we will specify the guidelines for conducting safe and effective classes.

First and foremost you need to conduct the classes under the guidelines of an established scuba instructor. All equipment assembly must be done by a trained professional. Since this is not a scuba class and the depth will never be deeper than their armpits, there will be no need for the students to understand how assemble the equipment but they must learn how to operate the equipment they are wearing.

Class members will wear a BCD (Buoyancy Control Device) with weights in the pockets; The BCD is attached to a tank and a regulator. There is no need for a snorkel on the mask. This is all the equipment needed for a shallow-water underwater fitness class.

The skills needed to learn are equalization, how to fill and empty the BCD and how to clear their mask. In reality the BCD should always remain empty since the goal is to easily get to the bottom of the pool (thus the weights in the pockets). But if they accidentally let air into the jacket, they need to know how to release the air.

Furthermore, mask clearing is a skill that is nice to know but also not necessarily needed in this class. If a student gets water inside the mask, all they need to do is stand up, clear the mask and then return to their exercise routine.

The mandatory skill to teach is equalization because even at 4'-6" of water hydrostatic pressure can cause problems with ears and the sinus. There should be a skill review portion during every class just to reinforce how to do each of these skills and the entire time to review these skills will take no more than 10 minutes. Remember, the key thing to emphasize to the students is to stand up if they have any problems. This simple reminder eliminates 99% of all fear they may have regarding the scuba equipment.



We strongly recommend that the teacher is in the water with the students during the pool session of the class. This differs from the AEA recommendation of teaching from the pool deck. The reason for this recommendation is that the instructor will need to have scuba equipment on as well to go underwater and assists students that may have problems with the routines being performed.

For communication, we recommend learning routines on the pool deck first and then doing them under water. We also recommend using the PADI (Professional Association of Dive Instructors) hand signals for the majority of the underwater communication that may be needed. If your facility has it in their budget, affordable underwater communication devices are available which allow the instructor to communicate verbally underwater and all students can hear the commands.

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The class format at Rutgers was designed to be fun, physically challenging and comfortable to the participants. To this end we have divided the class into a land portion and a pool portion. The land portion of the exercise allows the participants to fight with gravity as they do the yoga postures which generates heat and causes a good sweat.

Furthermore, we learn a simple 10 posture yoga routine that will then be duplicated once we get into the water. By learning the yoga routine on land first, it allows to students to freestyle the same routine in the water. This eliminates the need for complicated communication systems.

Once we get into the water we do a series of cardiorespiratory warm-up routines to keep the body warm and have the students acclimate to the water environment in a fun and useful way.



To get the students acclimated to the underwater environment we will have them go underwater after putting on the equipment and meditate for 5 minutes. This is where we must use the skills of equalization and the instructor can deal with any weighting issues related to buoyancy.



The Health Benefits of Underwater Aquatic Fitness

Underwater aquatic fitness provides benefits to the skeletal and muscular systems that are similar to those provided in shallow-water exercise. It also has unique benefits to the respiratory and cardiovascular systems that can be found in no other form of exercise.

The major benefit that underwater aquatic fitness provides to the skeletal system is that the bones, joints and ligaments are placed in an environment where there is reduced stress place on them from the laws of gravity. It becomes a great alternative of exercise for endurance runners that need a cardio workout without the stress of the constant pounding running provides. It is also a great alternative for people with sports injuries to rehabilitate and still get a workout.

The major benefit that underwater aquatic fitness provides the muscular system is that the viscosity of the water provides resistance in all movement directions. This means that exercise movements in the water will require more effort to achieve the same result.

The major benefit that underwater aquatic fitness provides the respiratory system is the

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consumption of 99.999% purified air. In a world concerned with the quality of the foods and water there is little escape from the air we breathe.

Most people today will pay a premium to drink purified water and to eat organic meats and vegetable and yet, there are few options to breathe purified air.

Underwater aquatic fitness provides that capability and provides a substantial advantage for the health conscious athlete. By breathing in purified air, it relieves the stress on the respiratory system to remove and filter the air internally.

Finally the hydrostatic pressure below water allows the lungs to function easier and consume more air with every breath. This is an

important benefit for anyone with respiratory concerns.

The major benefit that underwater aquatic fitness provides the cardiovascular system is the consumption of 115% purified oxygen when the breath is taken below water. Scuba provides the body with excess oxygen and nitrogen at depth. In deep water, excess nitrogen can be harmful, but in shallow water there are no negative effects to the body. But the excess oxygen will be used by the hemoglobin and provides the blood system with an oxygen bath and allows the body to perform exercises at higher levels of intensity.

The table below provides a summary of the major benefits that Underwater Aquatic Fitness provides to the body.

Major Health Benefits of Underwater Aquatic Fitness		
System	Major Benefits	Unique to Underwater Fitness
Skeletal	<ul style="list-style-type: none"> • Reduced Stress on ligaments and joints • Physical Therapy • Exercise alternative for the wheelchair bound with musculoskeletal disorders 	No
Muscular	<ul style="list-style-type: none"> • Increased resistance requires more effort • Resistance in all directions • Hydrostatic pressure compresses muscles • Physical Therapy 	No
Urinary	<ul style="list-style-type: none"> • Hydrostatic pressure aids kidney function • The body detoxifies itself of excess salts and bile • Removal of salts lowers blood pressure 	Yes
Integumentary	<ul style="list-style-type: none"> • Hydrostatic pressure firms the skin • Buoyancy pushes skin up that gravity pulls down • Pressure and increased oxygen aids in healing 	Yes
Respiratory	<ul style="list-style-type: none"> • Easier to breathe • More oxygen intake with each breathe • Breathing 99.999% pure filter air 	Yes
Cardiovascular	<ul style="list-style-type: none"> • 115% pure oxygen • Hydrostatic pressure allow easier heart function • Increased capacity to perform under stress 	Yes

The Benefits to Society of Underwater Aquatic Fitness

Aquatic Underwater Fitness will transform scuba diving operations at beach resorts. The current demographics of yoga participants in the United States are about 20 million people with 80% of that population being female. The demographics of scuba participants in the United States are about 1 million people with 80% being male. Underwater Yoga allows dive operators to tap into a market 20 times its size - comprised of mostly females who would never consider scuba diving, but will love to do Underwater Yoga. There is almost zero overhead for the scuba operators since they have already invested in the equipment and facilities for their scuba operations.

Dive Bermuda is scheduled to be the first operation in the world to offer Underwater Yoga to its clients. The picture below shows the beach where Underwater Yoga will be taught.



Dive Bermuda will offer Underwater Yoga on the beach starting Memorial Day weekend 2011

Aquatic Underwater Fitness will benefit physical therapy. The principle of buoyancy and the design of the Buoyancy Control Device allow a person to stand upright with zero stress on the bones or muscles. This is pertinent for people suffering from injuries that have confined them to wheelchairs (e.g. quadriplegics). In this water based environment the hydrostatic pressure compresses the limbs making blood flow easier for the heart and the upright floating position allows the patient to eliminate all stress from a body that is confined to a bed or wheelchair for 20 or more hour per day. I have used this extreme example, to illustrate the benefits of this activity but many less severe injuries can be treated with this therapy.

Aquatic Underwater Fitness will benefit athletic training. The principles of resistance, viscosity and drag to 100% of the body make Underwater Yoga an ideal environment for athletic training.

Underwater a person is able to exercise harder for the same amount of effort because of the resistance of the water and with less stress to the body. The viscosity of the water provides increased intensity to the same movements that are done on land.

Being under depth allows the body to intake compressed, concentrated and purified oxygen molecules into the bloodstream which have a positive impact on respiratory and cardiovascular function. Underwater aquatic fitness provides an ideal model to incorporate **FITT** (Frequency, Intensity, Type, and Time) principles of training for improving cardiovascular endurance in athletes. Finally,

the principles of buoyancy will decrease impact to the joints and ligaments.



Rutgers football and many other college and professional teams participate in traditional Aquatic Fitness as an exercise option. We believe that if these teams were to incorporate Underwater Aquatic Fitness it would not only provide the therapeutic benefits but would also improve the quickness, speed, agility, strength and stamina of the players.

Underwater exercise provides the body with 100% full body resistance versus only 60% body resistance of current head above water workouts provide. This extra 40% of additional resistance will increase the speed and quickness of the players. The increased oxygen intake and the benefit of the filtered air improve respiratory and cardiac function resulting in higher performance levels of strength and stamina.

For those players that suffer head trauma during the game the benefits of the increased oxygen and the compression of the hydrostatic pressure (even at 4'6") will benefit the healing process. Finally it is a medical fact that the reduced gravity of water allows the cardiovascular system to function with less effort in transporting blood from the extremities to the heart.

Aquatic Underwater Fitness will benefit aquatic recreation facilities. A recent episode of *Venture*, a business show on the Bloomberg TV network stated that yoga has become the fastest growing recreation sport in America. Therefore, in the same way that scuba operation at beach resorts will benefit from the increased customer base, pools and health club facilities will be able to offer scuba based exercise programs that will appeal to both young and old. Many people that don't like to swim will embrace this new form of exercise.

Aquatic Fitness is big business in America especially with the aging demographics seeking to live longer and healthier lives and looking for exercise options that provide positive benefits with reduced stress on the bones and muscles. Currently Aquatic Fitness provides two modes of exercise, shallow water, where the feet touch the bottom and the water is armpit high (around 4 feet-six inches); and deep water where the participants wear flotation belts around their waist and their feet cannot touch the bottom of the pool. Underwater Yoga provides a clear third option with all the benefits previously explained above.



Summary

It took almost 70 years from the invention of the aqua lung by Jacques Cousteau to incorporate a practical method for underwater aquatic fitness. The benefits to health and

society are plenty and our classes at Rutgers University are showing much promise in the areas thus stated in this journal article.

As the popularity of Underwater Aquatic Fitness grows this journal will document the necessary advancements that will make this useful form of exercise attain all the promise it has the potential to achieve.

Suggestions for Future Research

Rutgers University has an ideal environment for academic research in the area of Underwater Aquatic Fitness. The university boasts a world class exercise science department.

Furthermore, the Werblin Recreation Center is one of the finest aquatic facilities in the United States of America.

Finally, it is one of the few university aquatic facilities that contain a complete in-house scuba facility (including a compressor and all the equipment) which is less than 10 feet from the swimming pool. It also is only 10-feet from administrative offices which can facilitate research and computer monitoring of activities.

Listed below is an abbreviated list of potential research issues included the following questions:

- Does increased partial pressure of oxygen consumption at depth during exercise increase performance capacity?
- Does improved kidney function of underwater exercise improve overall health
- Is Underwater exercise an excellent alternative for diabetics with foot injuries who can benefit from the

healing properties of hydrostatic pressure and increased oxygen .

- What effects will excess purified oxygen have on brain function and memory during strenuous exercise?
- Does compression and buoyancy have any measurable benefits to reduce wrinkles or sagging of the skin due to gravity
- Does the increased oxygen at depth improve hepatic metabolic function?
- What is the percentage of increased workload that underwater exercise provides over the same land based exercise?
- What are the maximal heart rate and oxygen consumption responses for underwater fitness as compared to land based exercise?
- Will hydrostatic pressure for head injury therapy (specifically concussions) with the simultaneous intake of extra filtered oxygen increase the rate of cerebral healing?
- What are the benefits of filtered air on cardiorespiratory function during exercise?
- Can we measure if people confined to wheelchairs are healthier after doing underwater exercise?
- With the elimination of pressure against the limbs of wheelchair confined people how significant is the benefit to their integumentary system?
- How significant are the improvements in speed and reaction time for athletes training against water's full frontal resistance and viscosity?
- What are the effects of underwater training on land based performance?

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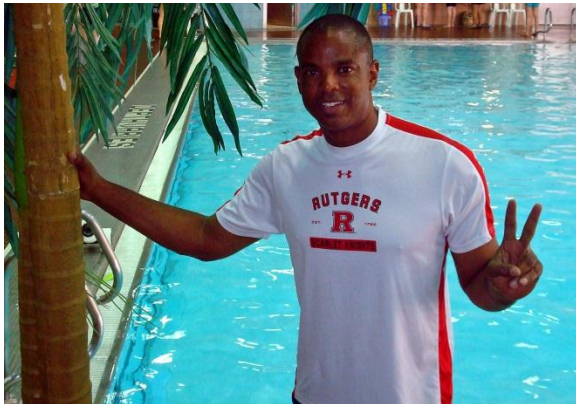
- Will patients recuperate from injuries faster when doing underwater physical therapy vs. traditional water based physical therapy?

Acknowledgements

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About the Author

Andrew Oliver is the inventor of Aquatic Underwater Fitness and the developer of the Underwater Yoga class at Rutgers University.



He is a certified PADI scuba instructor, an AEA Aqua Fitness professional, a certified Yoga instructor, a certified PSIA ski instructor and a WTF certified karate instructor. He has a passion for learning and teaching people to enjoy the recreation of life.

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