

AQUATIC BIOFEEDBACK

Ron Fuller, PTA, BA

Please tell us about your work in using Surface Electromyography (SEMG) biofeedback for rehabilitation and how you tied it into aquatics.

I started using SEMG many years ago for land-based orthopedic disabilities and was familiar with its use in the rehabilitation realm. After attending an aquatic seminar and talking with one of the speakers, a question was posed to me, “How can we gather quantitative data from aquatic rehabilitation?” I immediately thought about how I utilized the information from SEMG on land and wondered if I could somehow tie it in to aquatic therapy. After several months of experimenting with different types of bio-occlusive dressings, I finally found a covering that gave me the barrier I needed to utilize SEMG in the water. This technique allowed me the opportunity to treat clients with a multitude of diagnoses from orthopedic to neurological, reconstructions to spinal cord injuries, etc. I can customize my rehab to treat specifics, whether it be facilitation or inhibition of specific muscles or muscle groups. Our clinic has more referrals for aquatic therapy because of our ability to customize and record aquatic rehabilitation using aquatic biofeedback.



Ron Fuller, PTA, BA is the Aquatic Specialist for HealthSouth Corporation. Ron teaches aquatic therapy at several colleges and is a faculty member of the BFE.

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In the evolving field of health care, biofeedback, as a treatment and evaluation tool, is playing an increasingly more important role. Biofeedback is used by a diversity of health professionals to treat an ever-lengthening list of conditions. Health professionals such as physical and occupational therapists, psychiatrists, psychologists, nurses and physicians in various specialties have come to use biofeedback either independently or as an adjunctive technique with positive results.

The Expert Series is an on-going series of interviews with leading clinicians in the field of biofeedback lending their insights and techniques they have acquired through their many years of practice.

Thought Technology is very pleased to be part of this educational project. Since 1974, Thought Technology has been committed to making biofeedback more accessible through innovation in technology and educational initiatives.

The Expert Series interviewed Ron Fuller, PTA, BA, a physical therapy assistant, who practices at HealthSouth Rehabilitation Hospital in Concord, New Hampshire. Ron is the aquatic specialist for HealthSouth Corporation (nationally), as well as an adjunct faculty at several colleges where he teaches aquatic therapy and advanced orthopedic conditions to PT and PTA students. He is on the teaching faculty of Aquatic Consultants of Georgia (ACOG), as well as teaching workshops for the Biofeedback Foundation of Europe. He has authored several articles on aquatic rehabilitation and lectures nationally and internationally on aquatic therapy for orthopedic conditions and the use of aquatic biofeedback in the treatment of upper and lower extremity conditions.

What can you tell us about the use of SEMG in the water?

Studies have shown that early use of surface EMG in combination with exercise can be useful in rehabilitation more than just exercise alone.^{2,3,5,10} Several clinicians theorized that the use of surface EMG in this manner may help clients rehabilitate by, “increasing neural drive to the quadriceps and overcome inhibitory processes occurring in response to pain and edema.”¹ It seemed natural to combine aquatic therapy and SEMG as an adjunct to land-based therapy. By utilizing several physical properties of water (i.e. buoyancy and turbulence drag) the pool becomes the perfect medium in which to unload the joint, relieve pain, decrease effusion and initiate exercise during the acute phase.

Have there been any studies on the use of aquatic SEMG?

For several years, a union of the two modalities, biofeedback and aquatic therapy, had been casually explored, and only superficially researched.^{6,7,8,9} Not until recently has there been a focused effort to combine and functionally utilize the water and surface EMG. The first research article that I collaborated on was with Brian

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Awbrey, MD, showing that the technique of aquatic biofeedback was valid and reproducible. It also showed the therapist could assess their client’s progress quantitatively,

allow the client to effectively train while in the pool and ultimately, customize the treatment program to fit the individual needs of the client.⁴ Since that first article I have published several other articles regarding aquatic biofeedback.

Can you tell me about some of the other articles that you have published on aquatic biofeedback?

There are a couple of useful papers in the APTA Aquatic Journal, Volume 9, Number 1 (Fall 2001), *An Aquatic and Land-Based Physical Therapy Intervention to Improve Functional Mobility for an Individual After an Incomplete C6 Spinal Cord Lesion*, Vol. 7, Number 1, Spring 1999) entitled, “*Activity Levels of the VMO Muscle during a Single Leg Mini Squat on Land and at Varied Water Depths*”.

For general reading on Aquatic Biofeedback Technique I recommend a few articles that were published in Sports Medicine Update magazine (Vol. 15, Number 2, 2001), “*Aquatic Biofeedback Treatment of PFPS*”, ADVANCE for

PT’s & PTA’s (Nov. 2nd, 1999), PT/OT TODAY (June 5th, 1999) and “Rehab and Therapy Products in Review” (March/April 1999). Most recently in ADVANCE for Directors of Rehab. (Sept. 2000, Vol. 9, No. 9) there was an article on Aquatic Biofeedback.

Why haven’t we heard of aquatic SEMG until now?

There are two reasons why aquatic SEMG has played a relatively minor role in muscle rehabilitation and re-education. One was the inherent difficulty of the therapist to monitor SEMG activity in a pool environment. The other reason was a lack of clinicians willing to take their land-based SEMG expertise and equipment into the pool area. Although various authors have published articles regarding the use of aquatic SEMG, very few use it on a daily basis in the rehabilitation of their clients.

Aquatic biofeedback utilizes the same techniques and procedures as its land-based cousin. Skin preparation and electrode placement are still important, however the critical step is the application of a waterproof barrier to seal the electrode site. The waterproof barrier is the key to aquatic biofeedback. It enables the therapist the opportunity to specifically direct treatments and to collect quantitative data while the client exercises in

the water. Since the surface EMG unit is hand-held and powered by a 9-volt battery, the threat of electrocution is eliminated and site infiltration by water remains nothing more than a momentary light tingle. The possibility of saturating an expensive surface electrode however remains a more realistic hazard. The client performs their exercise routine while 'wired-up.' The therapist directs and records specific events of the treatment session.

Why is aquatic SEMG becoming so popular?

The addition of aquatic therapy in rehabilitation can provide an environment in which therapy can be initiated earlier, land-based exercises can be mastered sooner, and specific skills can be advanced quicker. Aquatic biofeedback, however, brings to the exercise regimen specificity, control, quantitative measurements and client education. In the real world, clinicians have time constraints as well as insurance considerations to keep in mind. The need to validate treatments or prove progress is an important part of the total rehabilitation picture. Quick treatment and rapid rehabilitation is imperative. Aquatic therapy offers the therapist the opportunity to start exercises immediately; aquatic biofeedback allows the client to know how to do the exercises correctly.

Is it true that the aquatic biofeedback is hard to do?

It used to be true when I started out and had to use the protective wrap method. The idea evolved from my search for an easy-to-use, waterproof seal for the SEMG sensor. Thought Technology and their research team developed an easy-to-use SEMG add-on. AquaSense™ connects to any of their SEMG sensors to adapt their use to the pool environment. This unique design allows the therapist to take advantage of the well documented benefits of the water environment easily and consistently for their biofeedback-assisted therapy sessions. AquaSense™ can be applied in seconds by attaching the sensor as the therapist normally would.

How do most clients react to aquatic biofeedback?

At first, they are somewhat skeptical. However, after they see the benefits derived from just a one-hour session, they are more comfortable wiring up for their pool session. The process of attaching the electrodes and donning the AquaSense™ sock (or glove) takes about three minutes so there is very little set-up time that cuts into your treatment time. AquaSense™ comes in various sizes so you can

find the right fit for your clients' arm or leg.

Aquatic therapy allows me the opportunity to start treating my clients sooner by utilizing the physical properties of water. Aquatic biofeedback streamlines my focus, enhances my treatment skills, and gives me quantitative useable data to assist my clients' rehabilitation.

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The addition of aquatic therapy in rehabilitation provides an environment in which therapy can be initiated earlier.

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