Double Trouble…a fitting format for us to offer at IAFC 2017 since we have a reputation for training in the water with power and intensity. *(Nino is well-known for plyometric training in the water, and Paulo recognized for timed training, using the swimming intervals, in vertical aquatic fitness.)*

We believe that the aquatic environment is ideal for improving health and fitness, but that the correct strategy must also be used to achieve specific results. As enthusiastic trainers and great friends, we decide to work together and develop Double Trouble, which explains how to increase intensity in the water with anaerobic power through various HIIT protocols.

**What is interval training?**
The basics of the interval training revolve around bioenergetics (a field of biochemistry and cellular biology focusing on energy flow through a living system). But don’t despair, for aquatic fitness we keep it simple! If we train at a moderate intensity, the exercise can be continuous; we are at steady state and using predominantly aerobic metabolism. As we increase intensity, we must allow periods of recovery because the aerobic system is not adequate for maximal energy expenditure.

At maximal intensity, the anaerobic system provides the majority of the energy our body requires for exercise. When we use predominantly the anaerobic system, first we lose speed, as the ATP-CP decreases, and then we feel muscle pain, as the blood lactate increase. The period of recovery during the intervals will refuel the muscle with ATP-CP and decrease the blood lactate level, thus permitting the body to perform another set of high intensity exercise.

**Why interval training?**
The basic reason is efficiency. Even with less time expended, we can still see great results. The use of the anaerobic system creates an excess of post exercise oxygen consumption (EPOC), which increases metabolism. This is a key reason to increase intensity during exercise, and the benefits are well documented in the literature. Tabata et al. (1996) studied the effect of moderate-intensity endurance (70% VO\textsubscript{2}max for 60 minutes) and high-intensity intermittent training (7-8 sets of 20-second exercise at 170% VO\textsubscript{2}max with 10 seconds rest between each set) on anaerobic capacity and VO\textsubscript{2}max. This study showed that moderate-intensity aerobic training that improves the maximal aerobic power does not change anaerobic capacity. Additionally, it was shown that adequate high-intensity intermittent training improves both anaerobic and aerobic energy, probably through imposing intensive stimuli on both systems. Many other studies suggest that high intensity intervals represent a time-efficient strategy, and will be discussed at our conference workshop.

**Who can participate?**
Most athletes use some protocol of HIIT in preparation for their sport, but HIIT isn’t only for athletes. Look at the various populations that have been studied and shown to benefit from this type of training:
Can we utilize HIIT in the water?
Most studies have used cycling to achieve the desired intensity, primarily because the bicycle gives researchers a stable condition to control the intensity. However, in practice, the intervals can be any type of movement, as long as the intensity during the “on” components is adequately increased. The pool has been a great environment to improve energy expenditure. Kruehl et al. (2009) compared continuous training and interval training (both in the water), and found greater values for VO₂ and Kcal expenditure with the intervals. Water is a great environment to improve strength; the speed against the water’s resistance was powerful enough to improve strength in different muscles (Butelli et al., 2015).

Join us for our session at IAFC to explore many other benefits seen with HIIT training in the water. For example, training obese patients who are at high risk for musculoskeletal injury, improving functional fitness and blood pressure, and increasing lower body strength for women ages 60 to 75 years old. Other studies discuss improvements in bone mineral density, improved flexibility, reduced stress on connective tissue, and even enhanced balance, function, and mobility for adults with arthritis. The impressive results in the water for special populations is because its safety; less impact (Kruehl et al., 2001) and less muscle damage (Pantoja et al., 2009).

How to control intensity in the water?
The correct intensity is the key of HIIT success, so how can we control intensity in the water? We suggest using the perception of effort (perceived exertion levels) to monitor intensity. At the ventilator threshold, perceived effort is at 16-17 on the 20-point Borg scale (Alberton et al, 2016); during the high intensity intervals, we should exercise over 17 on the Borg scale. Pinto (2011) suggests the use of a maximal cadence to optimize the neuromuscular activity in the aquatic environment.

What is the Double Trouble protocol?
Many different protocols will be used in this class to challenge various ability levels and provide training options. Sets of 20 seconds, 30 seconds, and 1 minute will be used for different exercises. Basic water exercises, such as running, skiing, jacks, jabs, and plyometric training will be combined to achieve our goals. The importance is to repeat the stimulus and respect the recovery period. Come feel the power of the water and enjoy this challenging experience – Double Trouble – at IAFC 2017.
AUTHORS

Nino Aboarrage is the director of Hidroesporte Water Activities Center. He teaches aquatic exercise, swimming, and biomechanics at the University Center of Rio Grande do Norte in Brazil.

Paulo Poli de Figueiredo is a physical education teacher, author, and international presenter. He is the director of the Acqualita Fitness Center in Brazil.

REFERENCES


