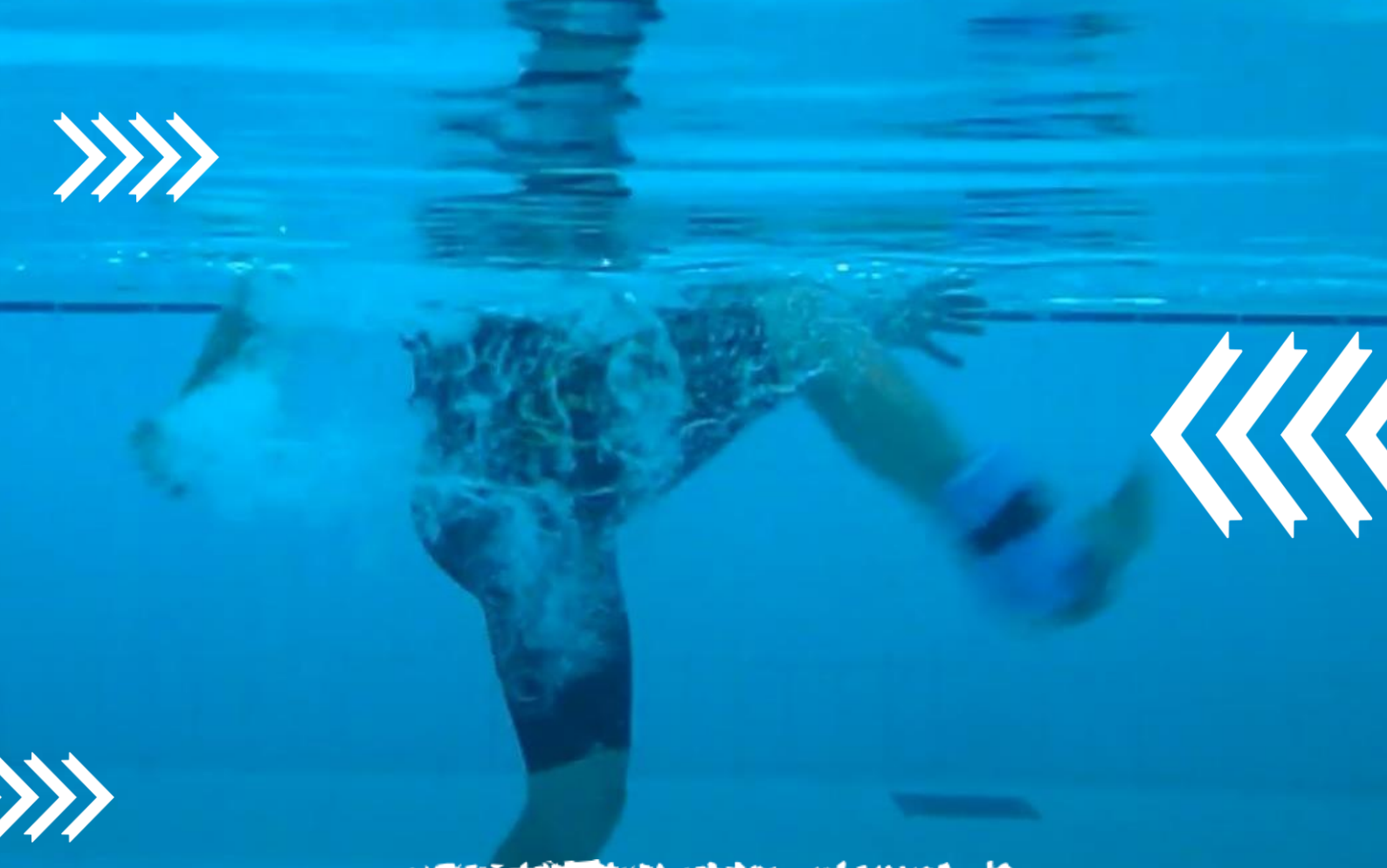

Pedagogical resources
AQUATIC ACTIVITIES

AQUA-HIIT

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AQUA HIIT

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This article presents the principles in which high-intensity interval training is based and offers essential practical resources for professionals to apply the AQUA-HIIT method in their aquagym lessons.

Introduction

Elite athletes have utilised high-intensity training for a long time to enhance their sports performance. Tabata (2019) quotes the Olympic athlete (1912 and 1920) Gösta Holmér, creator of the Fartlek method in the 1930s; Emil Zátopek, gold medallist in Helsinki (1952); and research carried out by Edward Fox in the 1970s, which established that the intensity of training is a key factor to improve the body's maximum aerobic capability after training with high-intensity intervals, as important factors in the popularisation of interval training.

High-intensity interval training (HIIT) has also been applied to aquarobics. In 1998, the author presented the technique at the International Fitness Convention in Brazil, and in 1999, at the IAFC/AEA in Florida. The proposal was based on the models presented in the book "Swim Faster" by Ernest Maglisho, substituting the swimming techniques for traditional aquatic aerobics exercises. He proposed interval series that were very defying, dynamic and innovative for the aquarobics world, which, at that time, was mainly focusing on the therapeutic and chorographical aspects. Many different names were given to this approach, such as Hydro Conditioning, Interval Training, Tempo Training, EPOC, Rock Roller Coaster or Aqua HIIT, among others.

Interval training has gained popularity in aquagym, and its effectiveness has been scientifically proven. However, it is important to remember that in order to carry out maximum or almost maximum intensity physical exercise, it is essential for the student to go through a previous medical evaluation, aiming to obtain the authorisation to execute the activities.

This article aims to present important aspects that the instructors have to consider if they want to successfully apply the AQUA HIIT method.

Know your public

The first principle of training is biological individuality. It is important to consider the characteristics of the users who will participate in the exercise program. The objectives, risk factors, injury histories and previous practices must be considered when choosing the protocol to follow. Respecting individuality is key for achieving success in every exercise program.

Active women (Kruel et al., 2009), postmenopausal women (Zhou et al., 2022), young men (Buttelli et al., 2015), adult men (Xin et al, 2014), healthy men (Kwok et al., 2024), inactive adults (Tang et al., 2022), obese teenagers (Liao et al., 2024), among other groups, have already benefited from aquatic HIIT programs.

Choosing the adequate exercise

The choice of exercise is fundamental to achieving the desired goals, as adaptations are specific to each movement pattern. Many professionals incorporate complex choreography into their sequences, which can make their classes unique, capture the students' attention, and improve coordination and memory. However, this can also limit the acceleration of movement and impede reaching maximum loads and controlling intensity.

In aquatic exercise, we are subjected to a strong transfer of force (action and reaction) and a tendency to imbalance. In this case, it is very important to think simply and focus on posture, ground support, range of motion, limb coordination and spinal stability. Correct execution is non-negotiable; the technique must be mastered before accelerating, because the speed of the movement makes it difficult to be aware of the movement during execution. The aim is to establish optimal coordination conditions, combined with maximum development of functional potential.

When choosing each exercise, it is necessary to consider the objective and the moment of the class in which it will be used, to think about the muscle groups involved, the initial and final position of each movement, the level of impact, the use or not of material and the transitions between exercises. In order to work with high intensity, it is important that the practitioner has technical preparation, prioritising the quality of the movement and not its complexity.

In addition, the instructor's supervision, involvement, planning of the sessions and correct demonstration of execution are essential elements for the Aqua HIIT program.

Load control

The magnitude of the load will be the relationship between the intensity and volume of the exercises, the interval between exercises and the sets. The greater the load, the greater the wear and the greater the need for adaptation to maintain body homeostasis, so there is a relationship between load quality, physiological stress and training adaptations. The elements that characterise the magnitude of the load are described below:

Intensity

In order to talk about adaptive intensity, it is important to understand what the Anaerobic Threshold (AT) is, since exercise intensities close to and above the AT are those that produce the greatest adaptations to training. Meyer et al. (2005) consider that the AT is the exercise intensity at which aerobic predominance gives way to anaerobic predominance, producing a metabolic imbalance with increased lactic acid concentration, increased production of carbon dioxide (CO2) and increased ventilation. This metabolic stress generates fatigue and does not allow the intensity to be maintained, forcing the exercise to be interrupted or a recovery interval to be carried out.

In aquatic activities, there is no speedometer like on stationary bikes, nor do we know how many kilograms we are carrying, there are variations in amplitude, frontal area and speed in the different exercises, the effect of floatability and different flow conditions at each moment, which makes controlling the intensity a big challenge.

Many professionals use the rhythm of the music in their classes, but by marking the cadence, we would have intensity changes in the different exercises. Alberton et al. (2007) analysed stationary running, kicking, front slide (Ski) and side slide (Jack) with variations in arm movement and found significant differences in heart rate (HR) and volume of oxygen (VO2) for the same exercise cadence. Consequently, the authors suggested the use of subjective perception of effort, maximum HR percentages or VO2 as strategies to control the intensity of aquatic exercise.

Alberton et al. (2013) validated a protocol to determine AT in stationary running, front kick and front glide exercises using HR deflection, a cost-effective way to monitor aquatic exercise intensity. However, HR is an inefficient parameter for short bursts of maximal effort, and variations in HR due to different water temperatures, immersion depths and the initial HR of each participant can be a problem when working in a group.

Another way to monitor exercise intensity is Rate of Perceived Exertion (RPE). Alberton et al. (2016) identified the intensity of 16 -17 on the Borg table of 6 to 20 as the intensity corresponding to AT. Therefore, intensities above this cannot be maintained for long and require breaks between exercises.

Peak effort has also been used in the literature (Aboarrage et al., 2024 and Tang et al., 2022) to control intensity in interval training. It is easy to apply and is frequently used by aquatic professionals.

Volume

Exercise volume is the relationship between the number of sets and the number of repetitions or execution time. As we are aiming to stress the anaerobic system, protocols typically use 10-second to 1-minute stimuli, and the number of repetitions varies between protocols. Tabata et al. (1996) use 8 sets of 20 seconds with a 10-second rest, and Tang et al. (2022), Xin et al. (2024) and Zhou et al. (2022) use 12 sets of 30 seconds of stimulus with a 1-minute rest. Buttelli et al. (2015) use 30-second to 1 minute and 30-second intervals, while Kwok et al. (2024) use 10 sets of 1-minute stimuli with 1-minute intervals.

Respecting the interval

It is during the interval that we prepare for the next stimulus. We look for partial rests in which the new stimulus will occur in a situation before exhaustion. This is precisely the metabolic exhaustion that increases post-exercise metabolism and requires physiological adaptation to training. If we take too short an interval, we will not be able to perform the new series due to fatigue, but if we lengthen the interval too much, we will have a total recovery of the energy resource, which is also undesirable for the objective of this type of training.

Motivating your clients

The desired results will only be achieved with the continuity of the exercise program, and to do so, students must remain motivated. Enjoyable and varied classes that offer results help our students to continue the programs. Hereunder we offer some actions that will help to motivate your clients:

- **Paying attention to the student**: the student must realise that the teacher pays attention to their performance and worries about them. Technical corrections enhance

the teacher's work and instil confidence in the students that they are doing the correct exercise.

- **Educating the student**: take advantage of the opportunity to speak about the benefits of physical activity and its peculiarities, as well-informed students tend to adhere to the exercise program. The information must be precise, punctual and easy to assimilate. They are knowledge pills that awaken the curiosity of the student.
- **Complimenting progress**: as changes are slow and accumulative, it is possible that the student does not notice them. That is why highlighting advances, comparing performance and complimenting effort is very important as a motivation strategy.
- **Understanding the difficulties**: someone who is absent or going through a bad time needs a sympathetic teacher. Understanding what is going on and being willing to help is a plus.
- **Considering mental health**: physical exercise is an extraordinary tool for the mind, as it helps with good humour, anxiety and self-esteem. Apart from physical effort, it is also important to stimulate relationships and sense of belonging. Connecting people and creating an interactive, creative and entertaining moment.
- **Creating a coming-back commitment**: finishing the session speaking about the next one. Create the expectancy that, if the student does not attend, they will miss something.

Results

Studies have informed of the time-efficiency relation (Tang, 2022) of HIIT, showing improvements in the physical condition (Aboarrage et al., 2024), bone mineral mass (Aboarrage et al., 2018), increase of energy usage (Kruel et al., 2009), body composition and lipid metabolism (Liao et al., 2024), hemodynamic and vascular function (Xin et al., 2024), post-exercise metabolism (Kwok et al., 2024), and muscular strength (Buttelli et al., 2015), with an excellent adherence to the exercise program (Bressel et al., 2014).

Practical recommendations

Hereunder, we will offer some practical advice:

Tabata: 8 x 20 seconds maximum with 10-second breaks.

The protocol is designed on a stationary bike and lasts only 4 minutes, with 8 sets of 20 seconds with 10-second breaks (Tabata et al, 1996).

Exercises such as static running, jumping, suspension exercises and different forms of punching are easily applicable. Leg kicking due to the large muscle mass involved in the

exercise, the perception of both localised and central fatigue and the lack of support on the pool floor make this exercise a good option to apply this protocol.

Many teachers alternate the exercises performed in each set. However, maintaining the same exercise or movement pattern is also important, as the program was designed with repetition fatigue in mind.

The protocol can be inserted at the beginning of the class, right after the warm-up, in the middle of the class or even at the end, before the cool-down. An option could be a Tabata kicking protocol at the beginning of the class, a hanging protocol in the middle and a punching protocol at the end.

It is necessary to be aware of the fatigue caused by the protocol, so be careful when using it at the start of a beginner class. Localised fatigue can make the student unable to maintain the pace of the exercise for the rest of the class. For beginners, adaptations can be interesting. For example, alternate one set at maximum intensity with another at rest. This increases the rest interval and decreases the number of sets, while keeping the student in the group.

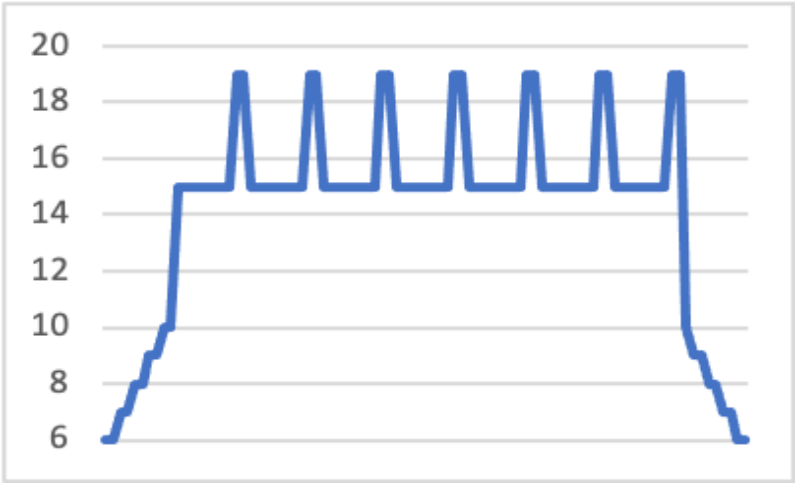
Gibala: from 4 to 6 sets of a maximum of 30 seconds with a 4:30 break.

This protocol was elaborated departing from Wingate's test of anaerobic power. This test lasts 30 seconds and takes place on a stationary bike (Gibala et al., 2006). The protocol's creators carried out 4 to 6 sets with intervals from 4 to 4 and a half minutes.

This protocol is easily adapted to aquagym classes. You can choose an exercise for the sets and use any strategy, as long as light to moderate intensity is applied between the sets.

Blocks with peaks: 1 minute with active pauses from 3 to 5 minutes (Figure 1).

Figure 1. Blocks with peaks.



Similar to Gibala, but with a 1-minute intense phase. The peak is the class's difference. By always choosing the same exercise in every peak, the aim is fatigue and resistance; by alternating exercises, we will prevent localised fatigue and work with a higher power.

Stimulus and recovery pyramid: 40:20 - 30:30 -20:40.

It refers to 3 minutes for each exercise with variable stimulus times and intervals. The stimulus time decreases with each hit, and the break time increases. The first strong take will last 40 seconds with a break of 20 seconds, the second will last 30 seconds of both stimulus and break and lastly, 20 seconds of stimulus and 40 seconds of break. After each sequence, start over with another exercise.

Concept revision

Table 2 serves as a guide to the success of the AQUA HIIT program. Your actions as a teacher must be based on references, being aware of the users' objectives, characteristics and needs, and choosing the exercise that is right for the public and their objectives. Additionally, you must manage the training's load in consideration of the class, plan medium and long-term, and motivate users to be aware of the importance of continuity. It is only by maintaining frequency that they will achieve their goals.

Table 1. Aquatic exercise HIIT protocols.

Reference	Population	Exercise type	Time	Set n. º	Stimulus	Interval	Result
Aboarrage et al, 2018	Postmeno pausal women	Jumping	24 weeks	20	30" maximu m	30" passive	> bone mineral mass and physical condition
Aboarrage et al, 2024	Elderly	AEA – Aquatic training	16 weeks	4 a 6 x 4	30" maximu m	30" passive	> strength, power, flexibility, agility, balance
Buttelli et al, 2015	Young men	Calisthenics circuit	10 weeks 2 x	4 stations of 3 exercises . 1 set x 3 sets of each exercise	30" maximu m	60" active between exercises and 1'30 between sets	Increase in the dynamic force of the upper and lower limbs regardless of the number of series
Kruel et al, 2009	Active women	Aquagym: race, ski, jack, kick	acute effect	8	2' SSE 17	2' SSE 9	Higher energy usage in interval routines
Bressel et al, 2014	Adults with osteoarthri tis	Aquatic running track with water streams	6 weeks 2 - 3x	3 a 6	30" – 1'20 at 13 - 19 RPE	1'-1'20 in the balance stream	Excellent adherence: improves balance, functionality and mobility with pain decrease

Kwok et al, 2024	Healthy adults	Stationary run with and without resisting materials	Acute effect	10	1' 90% maxHR.	1' active	> COPD. Resisting material > effort perception
Liao et al, 2024	Obese teenagers	AEA calisthenics - water x land	4 weeks	15	1' 80-90% maxHR.	1' active 50%	Improves corporal composition, physical condition, PA and lipid metabolism. Water>land
Tang et al, 2022	Inactive adults	HIIT swimming x continuous	6 weeks 3x	12	30" 95% maxHR.	1'	< blood pressure, > endothelial function and aerobic capacity. Efficient time only 18 min of effective work per week
Xin et al, 2024	Adult men	race land x water	8 weeks 3x	12	30" 80%-95% resHR.	1'	Increase of the corporal composition, hemodynamic function and blood vessels. Hiit > land
Zhou et al, 2022	Postmeno pause with different ACE genotypes	jumping	acute effect	12 + 3 resistive sets	30" resHR. + 20"	1' 50% + 10"	Increase of the PAS DDgenotype, regarding hit water jumping, decrease of the PA IDgenotype

Conclusion

The results will only appear with the continuity of the physical exercise program, and, to do so, it is necessary to keep the students motivated. Classes have to be enjoyable and varied, and show results in order to ensure adherence to the program. All classes previously presented are extremely dynamic and defying, and alternating them in a conditioning program is an excellent option.

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