

STATIC APNEA

MAMMALIAN DIVING REFLEX

The Mammalian Diving Reflex consists of a series of physical adaptations of the body that occurs in mammals under the conditions of apnea, water and pressure. The purpose of this reflex is to conserve oxygen, to use the oxygen more efficiently and prevent barotraumas. The Mammalian Diving Reflex varies from person to person and by nature is weak, but it can be induced to make it stronger, and it can also be increased with regular training.

The following describes the major physical changes that occur in our body due to the Mammalian Diving Reflex:

- **Bradycardia** - This means slowing of the heart. The heart is the biggest muscle in our body, each time the heart beats it uses oxygen. In breath-hold conditions our body will naturally slow down the heartbeat to conserve oxygen.
- **Vasoconstriction** - The blood vessels in our body will constrict, reducing the blood circulation in our extremities and increasing the concentration of blood rich in oxygen towards our brain when needed.
- **Spleen Contraction** - The spleen is an organ that stores red blood cells. When oxygen is needed, the spleen contracts by up to 20% and thereby releasing red blood cells into our system. This means that more oxygen can be carried in our blood. After 30 minutes of a freediving session this effect normally reaches its climax.
- **Blood Shift** - This is a very unique physical change discovered only during the last 50 years. This Blood Shift is what allows freedivers to dive beyond the residual volume of their lung capacity, which is normally reached between the depths of 30 to 40 metres. As we dive deeper and the pressure increases the capillaries that run through our lungs become engorged with blood rich in oxygen. This blood replaces the air space in our lungs and helping to avoid a dangerous injury known as a pulmonary edema.

The more often you dive, the more you develop your mammalian diving reflex. Simple acts like submerging the face in cold water before diving will stimulate our body to trigger this diving reflex. However, pressure changes are what stimulates the diving reflex the most; the greater the pressure, the stronger the diving reflex. Also be aware that the greater the pressure, the greater the risk of injuring yourself. Only with the right tuition and training can one adapt their body to reach deeper depths without injury.

--

STATIC APNEA

In this fantastic discipline you will realise the true potential of the human body. The sensation of suspending the act of breathing for several minutes can be extremely satisfying and very relaxing. There is no fight or struggle to do so, and by doing this you will increase your confidence and duration of your deep dives or other water activities such as spearfishing or underwater photography.

Static apnea is practised on the surface of the water either in a swimming pool or the calm shoreline of the sea. Our body will be as relaxed as possible with our airways submerged underwater.

First Stage of Static Apnea - Warm Up

- For static apnea there are different approaches for the warm up. Some freedivers feel more comfortable after a few breath holds before going for their maximum breath hold. Some other freedivers prefer to complete their maximum breath hold from the very first go.
- During this course, guided by your instructor, we will find out what is more suitable for your warm up. Since there is no diving involved, nor muscles used and no pressure changes, you will realise that with the right frame of mind towards the breath hold that no warm up is needed to perform a long breath hold on the very first try.

Second Stage of Apnea - The Breathe Up

- The breathe up for static apnea is different to the breathe up that we use for diving. Since we are at the surface, our physical perception of carbon dioxide will be much higher than deep dives. Therefore making our breath holds more uncomfortable. This is why our breathe up for static will be slightly different in terms of breathing speed and thus ONLY suitable for static.
- The concentration should be maximum during our breathe up, only thinking about our breathing of how the air goes in and how the air goes out. Having a wandering mind will dramatically and negatively effect the duration of our breath hold.
- We use the 2 section breathing and our breathing technique will be as follows:
 - Diaphragmatic Breathing (also known as Stomach Breathing)
We start our breathing with the lower section of the lungs and performing only diaphragmatic breathing, without moving our upper chest. We learnt this sectional breathing in the freediver course, however the speed of the breathing is now different, as we take 5 to 6 seconds to inhale and 5 to 6 seconds to exhale.

This diaphragmatic breathing will continue for the first 2 minutes of the breath up. Remember; do not over exhale, as we want to have maximum comfort during the exhalation. Since we are not using a snorkel during the breath up for static, we can control the speed of the air that goes in and out much easier with the 'O' shape that we create with our lips to pressurize the air.

- Diaphragmatic & Chest Breathing
Following the two minutes of diaphragmatic breathing we will start to perform full breathing cycles that consists of the stomach and chest. Starting with the stomach, we will move up to the chest, taking a relaxed full breath in 5 to 6 seconds; followed by a short pause of half a second and then the exhalation which lasts 5 to 6 seconds. We continue this breathing for between 2 to 3 minutes.
- The total duration of our breath up should never exceed 5 minutes, as we will be running the risk of expelling excessive carbon dioxide.
- The final breath
The final breath should be made with our 2 sections, always 100% but without tensing our muscles, since this would penalise our breath hold by breaking the relaxation that we have achieved during the breath up.

IMPORTANT TO REMEMBER!

This type of breathing is only suitable for static apnea or dry exercises and only after the correct tuition of how this breathing technique should be performed. The results can be disappointing or even dangerous if this advice is not followed.

Third Stage of Apnea - Relaxation

This is the most important part once we start the breath hold. We have to relax our muscles, but most importantly our mind.

- **Muscles**
 - On dry land
When practising a breath hold on dry land we must have a comfortable body position while lying down. Crossed legs or arms above the head is unnatural and uncomfortable. We will think about relaxing our body from head to toe. When on dry land a safety buddy is not necessary, but remember always to complete the entire breath hold in a lying down position, as you risk falling if you are standing or sitting.
 - In the water
WHEN PRACTISING THE BREATH HOLD IN THE WATER A SAFETY BUDDY IS ALWAYS NECESSARY.

Our body position will be much more comfortable than on land. Once we achieve total relaxation we do not feel any pressure on any of our muscles as we are suspended in water. Muscles like the neck and shoulders tend to be a bit tense the first few times we try static apnea. Always try and focus to make your body heavy by imagining a dead body position.

The **use of mask is not recommended**, as it will cover most of our face particularly around the eyes and the upper lip. These areas are the main triggers of the facial immersion technique that stimulate the Mammalian Diving Reflex when they come in contact with water. Rather, we use only a nose clip and small goggles if necessary.

- **Mind**

- **The mind will be our main tool** to increase the duration of the breath hold. The brain when active consumes between 30% to 40% of our available oxygen. The wrong thoughts, stress and fears will greatly increase this percentage and therefore greatly reducing our breath hold times. A common mistake is to be worried about the time of our breath hold. Looking at the watch will negatively effect our mind relaxation.
- The idea is to have a **blank mind**, however this is usually not so easy to perform. **Mental visualisations** of positive experiences and the reaffirmation of positive thoughts will be effective towards achieving a relaxed mind.
- Suggestions are to **visualise** a walk in the park, family and friends, or to visualise our heartbeat; try to imagine as much detail as possible with these thoughts, however do not force your mind into a particular thought as our mind will be more relaxed if we freely let it choose.

Fourth Stage of Apnea - Contractions

- Our relaxation will sooner or later be disrupted by **diaphragmatic contractions**. The diaphragm is the muscle separating the thoracic (chest) cavity from the abdomen, and is the primary muscle of respiration. Contractions of the diaphragm are involuntary movements; the function is to force extra oxygen into the blood by circulating the air in the lungs and increasing the pressure of the lungs, and thereby increasing the amount of oxygen available for our brain.
- **Contractions can vary** from person to person. Sometimes the contractions will start strong, but other times the contractions will start so soft that they are barely noticeable. They can come in a fast rhythm separated only by 1 or 2 seconds, or the length in between can also be as long as 15 seconds.

- Our **breath up** will also determine how early or late these contractions will occur. The objective is to have a good balance in between relaxation and the number of contractions.
- **We should not be worried during our relaxation phase about when the contractions will start**, since this can lead to a negative attitude towards static apnea. Instead we must understand that contractions are here to help, and therefore should be welcomed. The onset of contractions will induce a stronger bradycardia and a slowing of the metabolism. With practice and training you will learn to maintain a maximum relaxation even with the strongest contractions, allowing our bodies to function naturally and therefore maximising our oxygen availability.
- However, **do not ignore the strong signals sent by the brain that we are running very low on oxygen**. Fading or tunnel vision, or not being able to have a clear mind are definite signs that it is time to breathe. It is always better to finish our breath holds with a clear mind and total control of our body than pushing beyond our physical limits without any control. As you progress you will be able to push more and get closer to your physical limits. Don't fool yourself into thinking that it is easy to perform a controlled breath hold, as there is a very thin line between a correct and safe breath hold or an uncontrolled loss of consciousness.

TRAINING FOR STATIC APNEA

Static Apnea Tables

Training for static is about increasing our tolerance to low levels of oxygen and high levels of carbon dioxide. A good way to do this is by training static apnea tables. There are **two different tables**;

- **O₂ Table** - this table increases our tolerance to low levels of oxygen.
For example:

Hold 1 = 1:15, 2:30 rest period (Breath up)

Hold 2 = 1:30, 2:30 rest period (Breath up)

Hold 3 = 1:45, 2:30 rest period (Breath up)

Hold 4 = 2:00, 2:30 rest period (Breath up)

Hold 5 = 2:15, 2:30 rest period (Breath up)

Hold 6 = 2:30, 2:30 rest period (Breath up)

Hold 7 = 2:45, 2:30 rest period (Breath up)

Hold 8 = 3:00

- **CO₂ Table** - this table increases our tolerance to high levels of Carbon Dioxide. For example:

Hold 1 = 2:00, 2:00 rest period (Breath up)
Hold 2 = 2:00, 1:45 rest period (Breath up)
Hold 3 = 2:00, 1:30 rest period (Breath up)
Hold 4 = 2:00, 1:15 rest period (Breath up)
Hold 5 = 2:00, 1:00 rest period (Breath up)
Hold 6 = 2:00, 0:45 rest period (Breath up)
Hold 7 = 2:00, 0:30 rest period (Breath up)
Hold 8 = 2:00

The tables can be personalised according to your own breath hold capabilities. Over time you should challenge yourself by making the training tables harder, however remember that the tables shouldn't be close to your personal best static breath hold.

Apnea Walk

The apnea walk is an effective training tool to increase your tolerance to very high levels of carbon dioxide. While walking in breath hold, large amounts of carbon dioxide is produced, which makes this exercise very intense.

A training routine of two or three series performed a couple of times a week will definitely increase our breath hold and diving capabilities.

You should not leave more than 1:30 or 2:00 resting time (breath up) in between series, as the aim of the exercise is to keep accumulating carbon dioxide.

--

The same breath up that we learn for static can be applied to the static apnea tables and apnea walks.

These exercises can be practiced alone when performed on dry land. However, although the tables are performed lying down and thus there is no danger of falling, the same does not apply for apnea walks. At the beginning and the end of an apnea walk it is possible to lose consciousness and fall.