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Developing the fexibility, strength and balance of age group swimmers with special dryland exercises

Coaches and competitors devote all their efforts to decreasing resistance and increasing the force of propulsion while swimming.
The forming and maintaining of a streamlined body position and the continuous control of swimming motions makes the application of propulsive force more effective and decreases resistance. To obtain this balance, flexibility, power and continuous control of the central body parts are required. The name of this area is the body core or power centre.

Specialised Anglo-Saxon literature deals a lot with the notion of body core, and how to most effectively exploit it. The notion ‘core’ means a capsule, a kernel, the very best, the soul, or the nucleus of the Earth. So on one hand, a nucleus has to be imagined as something from which movement originates. On the other hand, it is actually a real muscle cylinder that encircles the waist. Just think about how the pulling move with the greatest range of motion is created by the swimmer with a rotating movement around the longitudinal axis in freestyle and backstroke, or the movements of the hips and shoulders twisting around the sagittal/transversal axis in breaststroke and butterfly. **2-es ábra**

So training sessions should be about the conditioning of each muscle based on its function, or much rather about the cooperation of all trunk muscles in formulating suitable balance, power and effectiveness. Even the strongest trunk musculature can impede the swimmer if it is contracted improperly or in the wrong order, narrowing the limbs’ range of motion.

Before the exercises which activate the body core are summarized, it is important to define this area based on other activities:

Erector spinae (contracting the muscles around the spine or the trunk) (**3-as ábra** and 4nem kell). They run along the cervical, dorsal, lumbar and sacral units of the spine in three columns, forming a tightly bound group of muscles. The lower back section is responsible for the extension of the trunk, and at the same time it controls the stability of the pelvis. When only one muscle group is contracted, then it is responsible for side bending and for trunk rotation. The sacral segment is the most mobile part of the spinal column.

The abdominals have two important tasks in human movement: **Új 3-as**

1.) in lateral and forward bending, and in trunk rotation
2.) in stabilizing the pelvis and the lower back

The internal and external oblique muscles (inner and outer abdominal muscles) act in the twisting of the trunk and in lateral bending. Their other task is to provide stability for the pelvis. The right internal and the left external oblique – if they are contracted at the same time – execute the rotation of the trunk to the right, which is important in the rolling movement of the freestyler.**4-es ábra**
The transverse abdominis that supports the abdomen as a corselet keeps the pelvis steady.
The rectus abdominis helps to execute the forward bending of the trunk.

Several other muscles are also attached, and control the relationship and movement between the spine and the pelvis, which flex and extend the pelvis. These muscles enable the central third of the body to move with a wider range of motion and greater force, and they also act in stabilizing the spinal column and the pelvis. Besides fixing the other segments of the spine, the whole trunk forms a more solid structure for the limbs to perform the work.

So the body core connects the lower and upper part of the body, enabling swimmers to (**5-ös ábra):**

- Maintain a streamlined body position, which does not affect only the gliding phases after the starting position and the turns. The swimmer tries to occupy as small a place in the water as is possible in order to create less resistance. With the proper vertical and lateral position, the power of the swimmer can be used to advance.
- Optimum trunk rotation can increase the stroke length by at least 10-15 cm in freestyle and backstroke. While a smaller part of trunk rotation is created by the leg kick, the greater part comes from the muscles of the body core, mainly from the oblique. This rotation is necessary for an effective arm stroke in freestyle and backstroke.**(6-os ábra)** The energetic undulation of the hips aids the propulsive force of the legs in breaststroke and butterfly, and provides a basis for the better exploitation of the force of the upper body.

The stability of the trunk controls the lateral and vertical movements of the body, so that the swimmer provides the smallest surface for the created resistance.

- The pushing force of the leg kick can aid the propulsive moves of the arms indirectly, as a result of the steady trunk position.
- Creating a steady basis allows the limbs to move with a greater range of motion. Thus neither the arms nor the legs have to do extra work (make an extra route) to offset the torque originating from the incorrect movements of the trunk.

When performing movements on dry land, the athlete interacts with the ground. In swimming there is no solid support area; force results in both the medium and the swimmer move away from one another. The body core is that steady starting point from which movements can originate, and can support the propulsive exertion of force of the legs and arms. Swimmers lacking this steady starting point often rely on their limbs in creating balance and offsetting the resultant torque, especially if the body position changes while breathing. As a result, swimmers cannot utilise the full potential of their body.

When proper force transfer is created between the upper and lower body parts, it is possible for the legs to push, instead of totally relying on the propulsive force of the arms.

The body is composed of segments, which are joined to create a unit for proper common functioning.**7-es utolsó ábra**
As the loops of the chain (wrist, elbow, and shoulder, upper and lower part of the back, hips, knee and ankle) are joined; if force is created in one segment, it aids the activity of the other segments as well. This is especially advantageous in swimming, where the medium lacks solidity. But the opposite of it is also true; if a certain segment of the body, its musculature or mobility falls short of the others, then energy is lost and it weakens the whole chain. When kinetic force functions well, power continuously flows between the legs and the torso. The weak point may result from a lack of power, poor muscle control, or from fatigue, thus blocking the flow of force and overloading certain body parts, mainly the shoulders.

If the demands of force exertion fall onto the relatively smaller muscles, fatigue, deterioration of technique and the onset of injury occur earlier. Furthermore, the position of the body in the water also changes, which means that the swimmer should elongate their pull to maintain even speed and to overcome the increased resistance. This can also be accompanied by a loss of balance, which swimmers try to offset with a wider or deeper arm stroke or leg kick.