

Volume XXI 2018 ISSUE no.2 MBNA Publishing House Constanta 2018



## Scientific Bulletin of Naval Academy

SBNA PAPER • OPEN ACCESS

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To cite this article: C. C. Olaru, Scientific Bulletin of Naval Academy, Vol. XXI 2018, pg. 190-193.

Available online at www.anmb.ro

ISSN: 2392-8956; ISSN-L: 1454-864X

### The stretching importance for improving the performance of the naval pentathlon athletes

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**Abstract**. Behind a ritual, stretching has long been used by all athletes, professional or amateur regardless of sports discipline, being practiced in various forms before or after the effort. Seen by most coaches and athletes as a true ritual, it has recently begun to be analysed by the researchers, and its role, considered beneficial, to be questioned for certain disciplined or for others.

#### 1. Introducer

Stretching is the activity that follows the controlled stretching of certain chains or muscle groups for the potency of the amplitude of the movements. The role of stretching, after many specialists of sport is found in injury prevention, reducing stress through exercise, increased mobility through these, improving performance.

The stretching of the muscles, carried out by stretching exercises, can be performed actively (without help) or passive (with the help of a person). There are four main types of stretching used for certain moments of physical activity, the intended purpose, or the level of mobility of the person performing them: static stretching, ballistic, dynamic, proprioceptive neuromuscular facilitation.

Static stretching, the most commonly used, involves maintaining a slightly awkward position, a determined time (15-60 seconds) in order to stretch a muscle chain or a muscle group.

The ballistic stretch consists in the execution of repeated swing movements and does not imply the maintenance of a certain position.

The stretch of proprioceptive neuromuscular facilitation aims to stretch a contracted muscle by performing the entire range of joints of the joint. It is recommended to use the passive extent in this case.

The dynamic stretch consists in executing more extensive, similar movement's actions to be taken.

#### 2. The effects of stretching

Mobility, with speed, power, resistance, is a motor skills involved in athletic performance (M Epuran, 1990). Mobility is also found under the term "motor capacity "as it is categorized by T O Bompa (Theory and Methodology of Training, 2002). As he claims the author, "mobility is a prerequisite for the performance of high amplitude skills and develops the ease with which the athlete can perform rapid moves ". TA can improve mobility by training; this being a necessity in certain sports where amplitude is joint or mobility reserve gives some confidence motion athlete.

The mobility of a joint is influenced by several elements, all embedded in its movement: the articular capsule with its shape, type and structure, ligaments, tendons and muscles adjacent to that joint. Environmental temperature and muscle temperature are also important factors that influence the mobility of a joint.

According to the research, the highest degree of mobility is obtained after a preliminary heating of the muscle through the movement. Muscles may shorten due to postural adjustment or scarring, muscle

spasm or regular contractions. All these causes lead to a limitation of mobility. Stretching follows the stretch of the muscle directly, but stretching exercises for this purpose also influence other structures, tensing them. Here we talk about tendons and ligaments that fix the joint and which have different biomechanical properties than the muscle.

There are recent studies according to which, not always the stretching stretches are beneficial. The fact that the stretch makes you feel good is one of the reasons not to hurt the injury, says Dr Ian Shrier, a sports medicine doctor at McGill University in Montreal and the author of numerous scientific studies on stretching. He also claims that "in general, stretching before physical exercises does not prevent injury."

Of the practiced stretching forms, static stretching is often used, which involves the extension of a muscle and keeping it in a slightly inconvenient position for a period of 15-30 seconds for beginners and up to 60 seconds for advanced. The most popular sporting activities are jogging and cycling, which also have an increased risk of accidents in the muscular system. Research on these sports activities, presented in the British Journal of Sports Medicine concluded that there is no evidence to confirm the effectiveness of stretching in the prevention of muscle disorders for joggers and cyclists. Even swimmers were recommended in that Article, by reference to such practices stretches before exercise, the shoulders and arms required for excessive mobility.

Similar research has also been carried out for endurance runners. The results highlight the fact that elite runners are less flexible than their non-elite counterparts (P Saunders, D Pyne, R Telford, J Hawley, 2004, Factors affecting the economics of running trained distance runners). The question arises as to whether reduced flexibility appeared to the professionals as an effort-adjusted one, was an undesirable effect of specific training or precisely this inflexibility has resulted in very good results? The answer appears in a research that found the existence of a gene called COL5A1 and associated with inflexibility (M Posthumus, M Schwellnus, M Collins, 2011, COL5A1 gene: A new marker of performance and resistance, Medicine & Science in Sport & Exercises).

The discovery was completed by a survey that investigated the presence of the COL5A1 gene in resistance runners. It has thus been demonstrated that endurance runners possessing this gene have a considerably greater operating economy than other study participants (C Baxter , R Lars , Mc Naughto, A Sparks, L Norton, D Bentley , 2016, Impact of Extent on Performance and Risk of Long-Range Runners ).

Economic effort is defined as the steady state oxygen consumption at a given operating speed, power demand to operate at a submaximal constant speed. In this sense, the study "Influence of flexibility on the economy of walking and jogging" accomplished of G Gleim , N Stachenfeld, J Nicholas (1990), published in the Journal of Orthopedic Research, conducted on uninstructed individuals , found that participants with the least flexibility had consistently the most effective operating styles. These results were justified by demonstrating that the decrease in the amplitude of motion leads to the stabilization of the pelvic region when the foot is in contact with the soil . This has led to a reduction in the excessive range of movement and hence to an increase in energy required to stabilize muscle activity. It has also been suggested that the tightness of the muscles and tendons could increase elastic storage and may therefore reduce the demand for oxygen (C Baxter, R Lars, Mc Naughto, A Sparks, L Norton, D Bentley, 2016, Impact of stretch performance and risk of injury to long-distance runners). Most studies suggest that stretching as a means of selectively influencing the body for competitive effort causes a decrease in motion efficiency.

Improving running efficiency in running can result in increased pelvic stability and reduced muscle activation required to support the foot on the ground to maintain stability. An additional study showed that acute stretching may result in an increase in the number of motor units re spared to perform the same mechanical work necessary without stretching. Enabling a larger number of motor units means an increase in oxygen consumption and energy consumption ( J Wilson, L Hornbuckle, J Kim, C Ugrinowitsch, S Lee, M Zourdos, L Panton, 2010, Effects of Static Expansion on Energy Cost and Rolling Perforation Performance, Journal of Strength and Conditioning Research ).

Finally, stretching is not an efficient tool as a means of heating long-distance runners. Although the data are not completely conclusive and the literature shows some disparity, there is not much to suggest that acute stretch has properties that can improve the performance of endurance athletes and may actually have the opposite effect. This research suggests that endurance athletes could best reduce their heating routine to a progressive, low-intensity run, and completely eliminate stretching practices.

Similarly to performance effects, there is no evidence to suggest that stretching has the ability to reduce the post-exercise muscle pain or chronic lesions in long-distance runners.

A large number of studies have investigated the relationship between stretching and the presence of post-exercise muscle pain, and the unanimous response is that the duration and intensity of these muscle pains cannot be influenced by stretching (E Dannecker, K Koltyn, J Riley, M Robinson, 2002, Influence endurance exercises on pain and muscle with delayed onset, Ep idiology and Clinical Medicine). Also, there was evidence to suggest that stretching would contribute to reducing delayed onset muscle pain in the literature for athletes of any discipline (R Herbert, M Noronha, S Kamper, 2011, Stretching to Prevent or Reduce Muscle Pain After Exercise (review). Specialists recommend that athletes who suffer from muscle pain after effort to investigate other methods of prevention, such as massage, freezing, or hot and cold therapy (GSforzo, A Ankita, T Swensen, 2011, Managing the onset of delayed onset muscle pain, Medicine & Science in Sport & Exercises).

Then what is good stretching and for who? Arnold G. Nelson, considered an authority with regard to the effect of stretching on muscular performance, and Jouko Kokkonen, a physician in sports physiology and athletic conditioning, have a wide range of research focused on the acute and chronic effects of stretches. Authors of the book "Anatomy of Stretching", 2007, are of the opinion that muscle flexibility has a lot of beneficial effects on the muscles and joints, both for performance sportsmen and physicians of loisir physical activity, as well as for people with various disorders. The dynamic stretching of stretching exercises helps to accelerate the activation of the nerves, facilitating faster and stronger contractions. "Because dynamic stretches increase muscle temperature and activation of proprioceptors, they are beneficial for improving athletic performance" (AG Nelson, J Kokkonen, 2007, Anatomy of Stretching, Lifestyle publishing). Following author studies, the benefits of a stretch program are:

- Increasing flexibility and energy, increasing muscle strength, increasing muscle strength
- Decrease in muscle pain
- Improve mobility of muscles and joints
- More efficient muscle movements and fluidity of movement
- Higher ability to exercise maximum force through a wider range of movements
- Preventing certain back problems
- Improve appearance and self-image
- Improving alignment and body appearance
- Better heating and relaxation during a physical activity session
- Keeping your blood sugar more efficiently

The naval pentathlon is a multidisciplinary sport practiced by the military, usually among the naval forces, and consists of scoring for each of the following five points: obstacle race, lifesaving race, utility swimming, amphibious cross-country, seamanship race. Overall, the events, have a high content of specific skills swimming, throwing, running, jumping, climbing, shooting, rowing and requires a complex athlete training. Analyzing the driving actions performed in the training and characterization of the naval pentathlon, I believe that in order to achieve the maximum performance d in the required motorcycle baggage in each of the samples described above should not lack mobility.

To improve the articulated mobility of the pentathlon athletes, an optimal muscular flexibility developed by stretching exercises is required. However, these exercises should be limited to developing a level of mobility that ensures the smooth execution of specific driving actions. According to studies, over-flexibility may favor injuries.

Stretching exercises are indicated to be executed in all necessary forms as a way of selectively influencing the body for effort after the end of the effort as a means of returning the body. It is necessary to perform the stretching before the effort to be preceded is a good warming of the muscles by movement.

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