

Documento de lectura

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## Stretching in football

Stretching is used to increase range of motion, as part of a warm-up, or cool-down or as a specific injury prevention strategy.

As usual, we want to give a short background on stretching, including physiology of stretching and different kinds of stretching.

### Physiology of stretching

Stretching itself means “to lengthen”. It would be a misunderstanding to think that only muscles are lengthened while performing stretching (1) - *see references below*. Connective tissues (2), such as tendons and ligaments, as well as receptors located in the muscles and the connective tissue can be elongated as well. The receptors within the muscles are called “muscle spindles” (MS) and the ones within the connective tissue are called “Golgi tendon organ” (GTO) (1).

The responsibilities of the MS and the GTO are to detect changes in length and tension, communicate with the nervous system (spinal cord and brain) and help in injury prevention through muscle activation or inhibition. The GTO is especially active at the end of range of motions to reduce activation if needed. However, in order to activate the sensors a certain threshold needs to be met. That is, the GTO relaxes a muscle while the MS can activate a muscle. There are some reasons to believe, that the MS can be habituated to a stretch threshold and therefore allows gains of flexibility. However, in order to take advantage of that accustomization, the stretch needs to be held for a prolonged time (a minimum of >30 seconds), maybe even repeatedly for a prolonged time. This process might also be one reason why force/power output is reduced after prolonged/extensive static stretching.

### Different types of stretches

The most common form of stretching is called **static stretching**. In this context, static stretching is mostly performed as a passive stretch where the muscle is not active and is stretched by external forces. Most of the times static stretching is used post-exercise in football as dynamic stretching seemed to better mimic football specific movement.

**Dynamic stretching** uses active movement of a limb to stretch the muscles. This form of stretching is also often called *active stretching* in football as the motion of the limb (usually) provides the stretch at the end of range of motion. If arms and legs are moved through its range of motion with a controlled speed, dynamic stretching is thought a safe type of stretching and should not be confused with ballistic stretching in which the movement through the range of motion is faster, nearly explosive and utilizes the so called stretch-reflex (SR) where MS and GTO are activated.

Dynamic stretching is more often used in warm-up as the majority of literature seemed to suggest better suitability with performances related to football.

**Proprioceptive neuromuscular facilitation (PNF)** is the third most common form of stretching. The stretching method consists of static-passive and static-active stretching in alternation (3). Usually the static-passive stretch is hold for about 15-30 seconds followed by a 3-5 second of 20% of maximal voluntary contraction (3) of the same muscle that has just been stretched against an immovable resistance. Another static-passive stretch should follow, where the former limit of range of motion can be exceeded.

## Stretching in adult vs. youth

Benefits of stretching regardless of the type of stretch are undoubted for adults (and professional footballers (8)) at any age (4). Possible results are increased range of motion, higher tolerance to muscle activity/tension and therefore a lower risk of injury (5, 6). The benefits of stretching might only be valuable for youth who have attained peak height velocity (PHV) and onwards. PHV can be described as the adolescent growth spurt, which occurs around puberty - in girls around the age of 12 and in boys around the age of 14. This seems to be the latest point in time to introduce the youth to stretching starting with the easiest form i.e. static stretching. Prior to PHV it seems that most youth possess adequate range of motion, which seemed to diminish with the onset of pubescence.

**Note:** *The majority of literature on stretching was on a mixed population and not necessarily on high profile football players as in (7)*

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