

## **Dynamic Warmup Routines for Sports**

Whilst the warm up for participation in any sporting or exercise activity is accepted as being essential for minimising injuries and improving performance, the methods by which many sports attempt to achieve this are less than ideal.

The warm up method used by many dynamic sports (both team and individual) usually includes an initial jog around the field or court, followed by 10- 15 minutes of static stretching. This is then followed by a few drills, and the athletes then begin their training session or game. Whilst the basis behind this methods may appear to be the sound application of current training principles, a closer analysis reveals major limitations with this method of preparing an athlete for a dynamic sport activity.

The main physiological reason for a warm up include; to increase core temperature (an increase in rectal temperature of a least one to two degree Celsius appears to be sufficient) (deVries 1980); to increase heart rate and blood flow to skeletal tissues, (Karvonen 1978) which improves the efficiency of oxygen uptake and transport (deVries 1980), carbon dioxide removal (Karvonen 1978), and removal and breakdown of anaerobic byproducts (lactate) (Karvonen 1978); to increase the activation of the Central Nervous System (therefore increasing co-ordination, skill accuracy and reaction time) (Hill 1927 cited in Shellock and Prentice 1985, deVries 1980); to increase the rate and force of muscle contraction and contractile mechanical efficiency (through increased muscle temperature) (Bergh 1980 and deVries 1980), and to increase the suppleness of connective tissue (resulting in less incidence of musculotendonous injuries) (Lehmann et al 1970, Sapega et al 1981).

The result of the above responses lead to an athlete's increased ability to do physical work (Bergh & Ekblom 1979), which is extremely important for sports requiring short duration high intensity work bursts such as sprinting and jumping (Bergh 1980, Karvonen 1978). The improvement in the nervous system is especially helpful for athletes involved in sports that demand high levels of complete body movement, such as team sport athletes.

The major criticism against the "TYPICAL WARM UP" is that it does not adequately prepare the athletes for the demands placed upon them in the ensuing session. Generally the initial jog is at a pace that has a minimal effect upon body temperature, and usually consists of jogging forwards, and in a straight line.

The stretching performed is usually that of static stretching, with most stretches performed slowly and with the athletes either standing still or sitting on the ground. This method of stretching has been shown to be beneficial for the increase in limb range of motion (Beaulieu 1981, Sapega et al 1981, Shellock & Prentice 1985, Taylor et al 1990), and aims to relax the muscles so that they are less resistant to passive stress for stretching. But this type of stretching does not prepare the muscle and connective tissue for the active contraction - relaxation process that will occur with any running, jumping or kicking movements as required in a dynamic sport training or game situation.

During this stretching period (typically from 5 – 20 minutes), the body is very efficient in removing excess body heat, so the small increase in body temperature from the initial jog is quickly lost if the athlete does nothing but statically stretch for this time. This is even more prevalent in cold climates or cold seasons (Autumn & Winter) which is when many team sport competitions are held. Many injuries occur at the beginning of a competition due largely to an inadequate preparation for the activity (Lehmann et al 1970, Sapega et al 1981). A poor warm-up can be one factor to be blamed for such injuries occurring, and can easily be corrected with a modification to warm-up procedures by the athletes involved.

Inadequate warming up can lead to less than optimal speed and skill levels that could result in quick scoring by the opposing team or individual early in the game leading then to athletes having to catch up placing more pressure on the player(s) involved.

To make changes to the way a warm-up is performed, the aim of the warm-up for a dynamic sport should be altered, such that the warm-up should be;

**The complete physical and mental preparation for the dynamic**

**actions to follow. The athlete should be able to begin the game or training session totally ready to perform at maximal intensity if required.**

The alternative warm-up procedures that I am suggesting is a variation of the above traditional method. With more active jogging and dynamic stretching techniques, the athlete will be better prepared for the ensuing session or game. In training situations the athlete will spend less time in the warm-up phase therefore allowing more time for the main body of the session where all the learning takes place.

The initial jog is now replaced with a more dynamic series of running exercises that include regular alternation of running forwards, backwards, sideways, high knee drills, butt flicks, crossovers, bounding, jumps and progressive sprints. This component will only take 2-4 minutes depending on the climate. It is expected that the athletes are breathing quite heavily at the end of this short series of exercises.

With the stretching component, static stretching can still be included in the program, as many athletes still feel they need some static stretching to really prepare themselves (with time it would be ideal to phase static stretching out of the warm up routine and place it only in the warm down period). One muscle group is stretched between each run or drill, Eg. the hamstring group, and the athletes are given approximately 30 seconds to stretch both hamstrings statically (this also has the affect of decreasing talk time between athletes which can be a major time waster, especially with younger athletes). The athletes are then directed to perform another dynamic activity, either an easy run-through or if running drills have been taught, they perform variations of skipping and running drills and butt kick drills.

A warmup sequence for athletes who feel they need to statically stretch could be as follows:

Jog forward, backwards, sideways, etc  
Bounds and jumps  
Static stretch of hamstring group (30 seconds)  
Run-through (forwards and backwards) or running drills (A's, B's etc)  
Static stretch of quadriceps group (30 seconds)  
Run-throughs/drills (higher intensity)  
Stretch adductors (groin) (30 seconds)  
Run-throughs/drills (higher intensity)  
Stretch calves (30 seconds)  
Run throughs/drills (near maximal)  
Stretch (athletes' choice)  
100% intensity sprint  
\*\* Start of training session.

Once the athlete has attained a mild sweat in normal ambient conditions, and is able to perform speed runs and drills at maximum (this process is progressive), the athlete should now be considered warmed up for the ensuing training session or game.

The dynamic stretching component is very important for the specific preparation of the musculature to dynamic movements. Dynamic stretching is defined as repetitive contractions of an agonist muscle to produce quick stretches of the antagonistic muscle (Kurz 1990), so any active callisthenic movement can be classified as dynamic stretching (jumping, body rotations, bending, etc).

This method very specifically prepares the muscle tissue for active muscle contraction and relaxation as required in a sporting situation. There is limited ability by this method to cause long term increases in range of motion due to the limited time that a muscle is held in a stretch. This short stretching time is not long enough to allow time dependant stress relaxation to occur, leading to minimal flexibility improvements (Taylor et al 1990). Therefore it is important to include some static stretching in the warm down to continue to improve; joint range of motion (Beaulieu 198 1, Sapega et al 198 1, Shellock and Prentice 1985, Taylor et al 1990); removal waste products such as lactic acid (Bale and James 1991, deVrivi 1980); and to increase the athlete's rate of recovery (Mickelson and Hagerman 1978, Hagerman 198 1, Kamen 1984, Bale and James 1991).

The total time for this type of warm up routine is approximately 5 - 15 minutes, with the athletes fully ready to perform as required by the coach at the end of this time. If compared to the many sports that have athletes warm up for 25+ minutes, this is a saving of approximately 5-20 minutes every session that could then be used for more work in the main body of the session. Assuming that due to an inadequate warm up the athlete takes another 10- 15 minutes to warm up properly during the main body of the training session there could be a saving of up to 25+ minutes per session. If the athlete trains 3 times per week for 40 weeks (a year of training) this could be a total increase in quality training time of 50-60 hours per year. Since one of the biggest limitations in coaching is the lack of time to develop all the attributes in the athletes you work with, to be able to add an extra 50-60 hours per year to the training program without adding any more sessions, may make the difference between your athletes achieving or not achieving the level of excellence that they and you as the coach are striving for.

The key to this type of warm up is to make the dynamic portion of the warm UP progressive and ensure that the limbs are taken through at least the ranges of motion that will be required in the game situation. The time for static stretching is after the game or training situation as this leads to more rapid recovery for ensuing sessions.

## REFERENCES

- Bale, P. and James, H. 1991. Massage, warm-down and rest as recuperative measures after short term Intense exercise. *Physiotherapy In Sport*. 13:44.
- Reaulleu, JY\_ 1981. Developing a stretching program. *Phys. & Spts Med*. 9:59-69.
- Bergh, V. & Ekbioni~ B. 1979. Physical performance and peak aerobic power at different body temperatures. *J. Appl. Physiol*. 46:885.889.
- Bergh, V. 1980. Human power at subnormal body temperatures. *Acta Physiol Scand*. 478. (suppi.):1-39.
- Blomstrand, E., Bergh, V, Essen-Gustausson, B. & Ekblom, B. 1984. Influence of low muscle temperature on muscle metabolism during Intense dynamic exercise. *Acta. Physiol. Scand*. 120:229-236.
- deVries, HA, 1980. Physiology of Exercise for Physical Education and Athletics Wilfiain C. Brown, Dubuque.
- Hagerman, F.C. 1981. Post-exercise pain. *Oarsman*, 13:14.17.
- Kamen, G. 1984. Stretch recovery patterns following exercise with an imposed myostatic stretch. *Arch. Phys. Med. and Rehab*. 65:178.181.
- Karvonen, J. 1978. Warming up and Its physiological effects. *Acta Univer. sitatis Ouluensis. Series D. No. 31. Pharmacologica et physiologica. No. 6*.
- Kurz, T. 1990. Stretching Scientifically. A Guide toFlexibility Training. Stadion Publishing. Cypress.
- Lchmann, JX, Masock, A.S, Warren, C.G. & Koblanski, Nj. 1970. Effect of therapeutic temperatures on tendon extensibility. *Arch. of Phy. Med. & Rehab*. 51:481-487.
- Mickelson, T. and Hagerman, F. 1978. Should you take the time for warm-up, warm-down? *Oarsman*. 10:15.19.
- Rigby, B. 1964. The effect of mechanical extension under the thermal stability of collagen. *Biochim. Blophys. Acta*. 79:634. 636.
- Sapega, A.A., Quedenfeld, T.C., Moyer, R.A. & Bulter, R.A. 1981. Biophysical factors in range-of-motion exercise. *Phys. & Spts Med*. 9:57-65.

Shellock, F.G. & Prentice, W.X. 1985. Warmup and stretching for Improved physical performance and prevention of sports-related injuries. *Spts. Med.*2:267. 278.

Taylor, D.C., Dalton, J.D, Seaber, A.V. & Garrett Jr, W.E. 1990. Viscoelastic properties of muscle-tendon units: the biomechanical effects of stretching. *Am. J. Spts. Med.* 18:300-309.