


Warm-up Essentials

by Jimson Lee

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Introduction

In essence, the warm-up is a very simple concept. In athletics, the athlete does whatever is needed to be 100% physically and mentally prepared for a training session or competition. Individuals have different needs requiring different routines, which is acceptable, but if the warm-up is well planned and executed it will result in improved performance.

A lot has changed since the earliest days of athletics, when the concept of warming up was being developed, and even the more recent times of the classic warm-up, consisting of a few laps of jogging followed by plenty of static stretching. Currently, coaches and sport scientists put a lot of thought into the warm-up process in an effort to help athletes achieve maximum performance and an edge over other competitors.

In this article the development of the thought behind warming up will be covered as well as why a warm-up is important. Sample warm-ups for sprinters and throwers will be provided

as both a general guide and a starting point for further discussion.

History and Trends

Sport science has paved the way to new methods of warming up. Below are some important thoughts developed over the past 130 years:

Loosening up: The idea of limbering or loosening up to prepare for a race goes back to the beginnings of the sport. Throughout the history of modern athletics, one could see athletes getting ready for competition by shaking their limbs, slapping the surface of their legs with their hands, and doing mobility exercises such as jumping jacks or making arm movements imitating large imaginary circles.

Jogging to raise core temperature: One of the earliest references to a warm-up routine can be attributed to Archie Hahn (USA), who won the 60m, 100m, and 200m titles at the 1904 Olympic Games in St Louis. In his coaching book, *How to Sprint - The Theory of Sprint Racing*, Hahn recommended a one-lap jog of 400m, followed by a 50-yard sprint at 50% speed for a warm-up, and then three to four practice starts.

Staying warm: The concept of maintaining body temperature between the warm-up and a competition stems from the days of Percy Williams (CAN), who won both the 100m and 200m at the 1928 Olympic Games in Amsterdam. Williams was well known for wearing several sweat suits as he approached the starting line. Prior to this, his coach massaged cocoa

butter on his legs and kept him under several blankets in the dressing in an effort to keep him warm and loose.

Static stretching: The advent of static stretching in sports followed a military study in the 1920's, in which a direct correlation between musculoskeletal injuries and muscle and joint range of motion was found. Since tighter or shorter muscles were more susceptible to injuries, it was believed static stretching would reduce the frequency of these injuries.

Dynamic stretching: Research in recent years has indicated that static stretching can actually inhibit performance. The thought now is leaning towards the use of dynamic stretching and flexibility, or range of motion exercises designed to get the muscle length and range to its optimal state. Range of motion exercises are not to be confused with drills, as the latter are simply repetitive cues to correct or adjust a biomechanical movement and positioning.

Post-activation potentiation: The generation of force and power comes from the muscles and tendons, and the motor units of these tissues are dependent on the excitation of the motor neurons by the CNS (central nervous system). Research has shown that greater recruitment is possible when the relevant nerve pathways are stimulated, or activated, as this strengthens subsequent impulses along the same pathways. An example of efforts to create a post-activation potentiation (PAP) effect is the tuck jumps or vertical jump-ups many sprinters perform before getting into their starting blocks. The ergogenic stimulus of PAP has been found to last between two and 30 minutes. However, further research is required to determine if PAP is beneficial for both maximal and supra-maximal efforts.

Back to basics? Eyewitnesses at the 2012 Olympic Games in London, where David Rudisha (KEN) ran 1:40.91 for an 800m World Record, saw him perform a 45-minute jog and nothing else. No drills, no mobility exercise, no stretching. If raising the core temperature and achieving the correct muscle tension is all that is required to perform at optimal levels, then perhaps we should not be trying to over com-

plicate the warm-up and just stick with what is essential once the training is in place?

Shorter warm-ups: Research in cycling has shown a shorter warm-up can reduce fatigue and increase power output.

Why is the Warm-up Important?

Each aspect of a warm-up has different benefits:

Muscle tone or pliability: In a way, the term “stretching” should be renamed to “checking”. If one can normally touch his/her toes before a race, but is a few centimetres short of the toes an hour before the race, basically he/she is “checking” if the muscle length is optimal. Psychologically, athletes feel they need to stretch or lengthen the muscles because they do not have the correct muscle tone.

Activation and mobilisation: Along with raising the core temperature of the body, there is the need to activate the muscles and motor neurons specific to the event and mobilise specific joints to a range of motion. Like muscle tone, the body requires the optimal full range of motion to perform at maximal effort. Activation and mobilisation work together. The athlete cannot perform a specific movement by contracting and relaxing muscles if the joints do not have the range.

Potentiation: Sprinting fast or making the fast movements in a jumping or throwing event is all about muscle contraction and relaxation of the agonist and antagonist muscles. Therefore, any means to increase potentiation, the strengthening of nerve impulses leading to muscle contraction, immediately prior to training or competition is a logical goal for a warm-up.

Improved oxygen delivery: Increasing oxygen delivery is accomplished by increasing blood flow to active muscles. This is helpful for the delays between the end of the warm-up and the start of the competition. A warmer body takes longer to “cool down” or return to homeostasis than a cooler body.

Injury prevention: The athlete is simply trying to prevent a muscle pull or cramp prior to performing a maximal effort. A warmer, looser muscle ready for contraction is believed to be less likely to cramp than a colder, tighter muscle.

Mental preparation: The athlete's mind needs to be ready, not just his/her body. In the case of training, the warm-up is a time for the athlete to focus prior to the session. In the case of competition, the warm-up is a great time to prepare for the performance, though athletes should be mentally preparing before getting on the bus to the stadium!

Principles and Considerations

Standard coaching textbooks tell us that the ideal warm-up starts slowly and gradually and involves all muscles and body parts in exercise that prepares the athlete for the training or competition to follow. All exercises should be ones that the athlete can do well. The warm-up is not the time for the coach to be teaching skills, although feedback may be provided to remind the athlete of the correct movement.

Coaching texts also tells us that in principle, an effective warm-up should progress from:

- slow to fast
- active to dynamic
- general to specific
- simple to more complex

Other generally accepted considerations about warming up include the following points:

The warm-up is PART OF the workout:

Some younger athletes may feel the warm-up is a waste of time. So it is important for the coach to reinforce that the warm-up is the first unit of the actual workout. Moreover, what the athlete does on the day of competition should closely match what is done in training, so learning and refining the warm-up routine in training is important.

Event type: The longer the activity, and the less intense the activity, the shorter the warm-up re-

quired. This is assuming that less intense activity generally means longer duration. For a sprinter performing a maximal effort of 10 or 20 seconds, an hour warm-up is reasonable. A four-hour mar-a-thoner has different requirements than a 2:08 marathoner because the intensity and speeds are much different. Jumpers and especially throwers have even different requirements.

Ambient temperature and humidity: This is common sense, as a warmer body requires less time to get warm and ready. The 1972 Olympic 100m gold medallist Valery Borzov (URS) would start his warm-up 60 minutes before his race in warm weather, and 70 minutes in colder weather.

Timing and prior events: Borzov would only do a 40 minute warm-up if he had run a race in the two hours prior to a competition, as is often seen in championships between semi-finals and finals.

Timing of checking in: Athlete should be sure to know the schedule when they need to check in and get to the Call Room or marshalling area. Once inside, they can sit, or get up and do light drills and mobility exercises. They may not be able to do sprints!

Preparation for the unexpected: Of course, there are things that cannot be controlled, and two good examples are multiple false starts in sprint races and delays from a protest. One has to simply look back at the cases of Linford Christie (GBR) at the 1996 Olympic Games 100m final, or Jon Drummond (USA) at the 1993 World Championships in Athletics 100m quarter finals. In both cases, the race was delayed because of the athlete's refusal to leave the starting area after being charged with a false start and subsequent disqualification. Their actions were at the expense of the other seven sprinters waiting for the race to commence, but the subsequent performances showed that a well-tuned body with a good cardiovascular and circulatory system should stay warm with the optimal muscle tone for a long period of time before eventually cooling off. For the athlete, the better the general fitness, cardiovascular and circulatory systems,

the longer they can stay physically warm and ready. This is why low intensity tempo runs (i.e. 10 x 100m at 70% speed) on recovery days are beneficial for sprinters. Of course, being mentally ready is critical in such situations, but that aspect is beyond the scope of this article.

Sample Warm-up for Sprinters

- Start with general movements of low intensity to raise core temperature
- Perform dynamic flexibility and drills like the Gerard Mach Drills
- Repeat with increasing intensity

Once warmed up, try movements specific to the event - these can be ballistic movements of jumping or short sprints of increasing intensity and distances.

General activities include jogging, skipping and shuffling, progressing to more specific activities, like drills, lunges and hurdle mobility exercises. This a great time to test the neural response and bio-motor capabilities, like Gerard Mach's A-skip, B-skip, C's (also known as butt kicks) and Power-speed drills.

Athletes can then do up to six runs or "strides" of increasing distances. For example, the first run of 50m starts with acceleration at 20% speed and ends at 50% top speed. There is then a slow walk back. The next run is 60m at 30% speed ending at 60% speed. The last run is 100m ending in near top speed.

One last addition to the warm-up for sprinters could be an activity to stimulate a PAP effect, assuming, of course, that the coach and athlete accept the current thinking on PAP. This would normally involve performing a near-max effort about 20 minutes before the race, or before the mandatory check-in and entering the control room. For a 400m sprinter, this could be a 150m sprint on the warm-up track.

Sample Warm-up for Throwers

The warm-up for throwers is similar to a sprinter's, with the key difference being the emphasis on the muscle groups specific to their events (i.e., more upper body without ignoring the lower body). Similar to a sprinter, maximising power and speed are very important for enabling the thrower to accelerate the implement. Therefore, the key role for the warm-up is the increase in the rate and force of muscle contraction.

Typically, a thrower's warm-up begins with a five to 10 minute jog at speeds much slower than a sprinter's, in order to increase the core temperature. The jog, resembling a shuffle at times, is followed by dynamic stretches of the muscles of the: upper body (shoulders, chest and arms), the abdominals (core region) as well as the legs. Given the nature of their event, throwers will also perform range of motion exercises.

Part of the warm-up for throwers consists of accelerations and drills. Throwers need to move their legs quickly. Four to eight accelerations of 10 to 20m with a full slow walk back for recovery is sufficient. The drills can be of any type with emphasis on explosive movement and agility. Lunges (full and half), hops, bounds, plyometrics, quick foot turnover drills, and sideways running with twisting are some drills that can be used.

Finally, the thrower should perform specific throwing movements mimicking the motion of the throws such as the use of a lighter implement or weighted tennis balls. Given the nature of the forces generated, this is a vital stage in the warm-up allowing the athlete to determine if they are ready or not.

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