CompassSport Series - Fitness for Orienteering

Part 6 – 'Secondary' Fitness Training

This series of articles over the past year has been aimed at helping the orienteer, irrespective of their age, ability or ambition, to develop their understanding of the fitness aspects of the sport and to help increase their enjoyment of orienteering through a logical approach to fitness development.

The previous two articles in the series addressed the core orienteering specific fitness elements of endurance and strength training and examined in detail the methods for maximising their development. This article concludes the series by focussing on other, 'secondary' aspects of fitness development, such as flexibility, and gives ideas for how we might improve these aspects.

Fitness Factors

Previously in this series of articles the important fitness characteristics to be developed by the orienteer have been outlined, with the pivotal aspects being:

1) Aerobic capacity (endurance or stamina)
2) Anaerobic capacity (lactate threshold and tolerance)
3) Muscular endurance/strength (primarily leg and core)

Once these primary elements have been improved, and a strong foundation of orienteering specific fitness established through a gradual, progressive programme, then it becomes important to look at integrating other components of fitness work that will enable the orienteer to take their performance onto the next level. Other relevant components to consider at some point are:

1) Flexibility
2) Speed/power (especially for those focussing on sprint racing)
3) Balance/agility

Flexibility Training

The development of flexibility for athletes, and the various training methods that exist, is one of the most controversial aspects of fitness training, and, even with a growing body of research in this area over the past twenty years, a number of significant questions remain unresolved.

Traditionally, through the 80's and 90's, the common belief from most quarters was that a programme of static stretching would assist in helping athletes to increase their range of movement (ROM) at key sites around the body, improve their technique and motor co-ordination and reduce the incidence of injury. The use of static stretching techniques was applied religiously to warm-up and cool-down practice before and after exercise and static stretching was the fundamental core of any work to increase general flexibility. However, the scientific basis of this methodology was completely unfounded and the philosophy was established more on a 'common sense' approach than through a logical, credible bank of sport science research.

Recently, though, a number of articles have appeared in the scientific press, which begin to cast doubt on this traditional approach, and practitioners have, alongside this work, introduced a number of alternative systems for the improvement of flexibility. The use of dynamic, ballistic and PNF techniques have all been suggested as having validity and been proposed as more appropriate methods for athletes to consider.

Some of the issues around the use of static stretching techniques have arisen from studies that have looked at the effects of such programmes on running economy, a variable we have discussed in previous articles and one that is highly pertinent to the competitive orienteer. Gleim et al. (1990) and Craib et al. (1996) correlated different joint flexibilities with running economy and their findings showed that less flexible joints improved running economy, basing their data on the fact that increased stiffness allowed a greater return of stored elastic energy built up during the repetitive stretch-shortening cycles (SSC) of the running action. Jones (2002) replicated these findings in a study on thirty-four international-standard male distance runners. However, this research has since been contradicted by Nelson et al. (2001), who discovered that a 10-week programme of static stretching exercises made no significant difference to running economy values, even though overall improvements were seen in their flexibility measurements. Undoubtedly, this remains an area for further study, as these reports were limited in their scope and much more work is needed in this field before conclusive statements can be made about the effects of flexibility programmes on running performance.

Another area of debate around the use of flexibility training is related to injury avoidance. It has been proposed throughout training literature (Nelson & Bandy, 2005) that a regular programme of flexibility work, including the use of stretching before and after exercise, helps to reduce the occurrence of injuries. The most common type of stretch technique has been that of static, which has the advantage of being straight forward, does not require any assistance to perform and 'carries the lowest risk of injury' (Nelson & Bandy, 2005). Whilst static stretching has been shown repeatedly to improve flexibility, the resultant effects on injury avoidance and performance enhancement have been contradictory. Hubley-Kozey and Standish (1990) showed, through a review of studies, that no proof existed that stretching of any type reduced the risk of injury. Further research, especially well-conducted randomized controlled trials, is needed to determine the proper role of stretching in sport.

Flexibility Training Recommendations

Whilst it remains difficult to make concrete recommendations on the back of the current research in this area, there remains a sense that one should still look to develop ROM through an active flexibility programme until strong and unequivocal evidence exists to the contrary. Consideration by the orienteer should be given to adopting one of the following techniques:

- Static
- Dynamic
- Ballistic
- PNF
- Eccentric

Static flexibility exercises are often the easiest and safest for the developing orienteer to conduct and are the primary focus of this article. Once these have been mastered, the orienteer should start to examine the use of more advanced techniques, such as PNF, but these will not be discussed here. Future articles may well explore such practices in more detail.

Static Flexibility

The orienteer should focus here on stretching the primary muscle groups of the lower body, including quadriceps, hip flexors, hamstrings, adductors and calf areas, as these are the main locomotive muscles involved in orienteering activities. A programme of around 8-12 stretches, working on these major muscle groups would be advisable. A number of stretch techniques exist, but it is important to avoid those shown to be contra-indicatory and potentially damaging to the tissue around the joints, eg. straight leg toe-touch. Most modern texts avoid the use of such exercises and a variety of good websites also illustrate the correct technique to adopt.

In terms of recommendations for length and frequency of stretch, Bandy and Irion (1994) demonstrated through their research that stretches held for 30 and 60 seconds were more effective at increasing flexibility measurements than those held for 15 seconds. There was no real difference found between the 30 and 60 second stretch lengths, so it would seem sensible to advocate that orienteers should look to hold stretches for no more than 30 seconds each. Bandy et al (1997) also demonstrated that 1x30 second stretch was as effective in increasing flexibility as 3x30 second stretches on the same muscle group and so, again, orienteers can assist themselves here in minimising their time spent on stretching by only performing each stretch in their routine once and be content in the knowledge that this will still assist in improving their ROM effectively. In the Bandy et al (1997) study a stretch protocol repeated five times a week was used but, unfortunately, no comparison of different frequencies was attempted by the researchers. It would be interesting to see whether a reduced frequency still results in significant changes in flexibility and if there is a minimum occurrence required within a microcycle, below which no changes are made to suppleness. It is likely that an orienteer would need to perform a stretching routine at least 2-3 times a week to see long term adaptations being made to their ROM.

Speed/Power Training

As outlined in the first article of this series, the predominant energy system at play in all orienteering events is the aerobic pathway. However, as the competitive distances shorten and the intensity of racing increases, as seen in ‘sprint’ racing, the anaerobic system comes increasingly into play and may contribute as much as 25% of the overall energy production. Athletes who see themselves as sprint specialists may therefore have some justification for including an element of sprint and/or power training in their programmes, although there is a dearth of scientific research that examines the use of speed work for endurance athletes.

For these individuals, it is important that the year long programme still has the fundamental development of aerobic and muscular endurance at its core, but in the final preparatory phase of training, prior to the competitive schedule commencing, an increasing amount of anaerobic work becomes even more important than usual. Previously, in the fourth article of the series, methods of developing top-end aerobic fitness through tempo, interval and fartlek work were discussed and it is expected that

a sprint specialist would still undertake this exercise, in a gradual progressive fashion, through the specific preparatory phase of their periodised programme. This would then give them the foundation to then introduce speed work to their training.

Speed Training Recommendations

The methods of developing speed are varied and are categorized by Baechle & Earle (2008) as 'primary, secondary or tertiary'. This continuum of methods is outlined below.

Primary Methods

Here the focus is on the development of sound running technique. Observing orienteers, it is possible to see a variety of running styles, some of which are uneconomical, restrictive and, potentially, giving rise to injury when performed at speed. In order for the athlete to perform high-intensity work, therefore, it is important to develop a solid technique and to improve running mechanics. The focus of early speed work should be on improvement of form and rectifying of faults and this can be achieved through gait analysis, conducted via video recording, and the use of running drills to promote correct skill acquisition. Running drill examples can be found on the strength and conditioning DVD, available from British Orienteering, and various others exist on the internet.

Secondary Methods

Here, once the correct running technique has been developed, the focus now shifts to sprint resistance and assistance training. Sprint resistance techniques incorporate the use of gravity-resisted running (eg. uphill or upstairs sprinting) or other aids (eg. parachutes, sled, weighted vest) which act to place a resistive load on the runner and help in improving explosive strength and stride length. Loads must be used conservatively, as >10% changes in movement resistance have a detrimental effect on technique (Baechle & Earle, 2008).

Sprint assistance training is looking to achieve an 'overspeed' effect, and examples include downhill sprinting on a shallow slope (<7 degrees) and high-speed towing (harness and stretch-cord). Here the aim is to improve the athlete's stride rate, but again assistance must be used cautiously and maximum velocity is not to be increased by >10% (Baechle & Earle, 2008). Repetitions of these exercises can vary between a few seconds to several minutes, but the intensity is very high (90-100%) and the rest intervals must be long enough to allow complete recovery between reps (3-5 minutes or heart rate <100bpm). The session does not need to be long (possibly only 3-6 reps in some cases) and must be finished when the quality of the movement mechanics and the speed output begins to drop. These sessions are highly demanding and it is likely that they will be performed only once or twice a week during the specific preparatory phase of the training programme.

Tertiary Methods

This work includes supplementary training in addition to the primary and secondary methods above. It includes flexibility training to increase ROM, strength training that targets explosive exercises (eg. squat jumps) and speed-endurance work that is conducted through use of high-intensity repetitions. The orienteer who reaches this stage of development will logically be undertaking much of this already and the training programme should be achieving now a degree of 'symbiosis', where much of

the training compliments itself and assists in the overall development of the 'all round' orienteer.

Balance/Agility Training

Orienteering as a running sport is unique in the diversity of terrain that can be encountered, even at a single event, where the athlete may be asked to run across surfaces ranging from flat, fast tarmac, to uneven, grassy tussocks within a few metres. Only cross-country running comes close to matching the physical demands of competing on such a variety of surfaces. It becomes obvious, watching elite orienteers, that they have developed, through years of competing and training on such surfaces, a strong technique that enables them to maintain form and speed across a diversity of terrain. It is therefore of specific interest to orienteers to look at developing a solid base of agility and dynamic balance ability, so that they can cope more easily with the demands of multi-terrain running.

Again, as with many areas of fitness, there is a lack of orienteering-specific research that examines the effects of a programme of balance and agility training on orienteering performance. However, there are a range of studies that have investigated the use of such methods on general function and it is possible to extrapolate across from these findings. DiStefano et al. (2009) reports that 'there is strong evidence to suggest that balance training' can 'improve dynamic balance ability' and that 'poor balance may result in lateral ankle sprains and it can explain differences between individuals with and without functional ankle instability.' Research by McGuine and Keene (2006) and Wedderkopp et al. (1999) has found that balance training decreases the rate of ankle sprains, with Olsen et al. (2005) reporting also that overall lower extremity injury rates are reduced following balance training. The implications for injury avoidance in orienteers here is obvious, with the lower leg joints placed under repeated stress during running in difficult, uneven terrain.

Balance/Agility Training Recommendations

The type of balance and agility training does not appear to influence the ability to gain improvements, according to the review by DiStefano et al. (2009). Of the four reported studies examining dynamic balance ability (Holm et al., 2004; Kovacs et al., 2004; Myer et al., 2006 and Rasool and George, 2007) a range of dynamic exercise were used, including the ability to acquire stability after landing from a jump on one leg with eyes closed, performing contralateral leg movements while maintaining a static stance, and making a tilt board move in specified directions while balancing in a single-limb stance. All of these studies reported significant improvements in dynamic balance ability.

Progressive exercise should be followed, with beginners commencing on double-leg exercises with eyes open on stable surfaces and gradually moving through to single-leg exercises with eyes closed on an unstable surface, such as a wobble board, foam pad, swiss ball or balance trampoline. Circuit training could easily incorporate balance and agility exercises, using such equipment, to increase variety and bring in elements of balance training steadily. Research has implied that the minimum training period used to gain balance improvements was 10 minutes, 3 days per week for 4 weeks (DiStefano et al., 2009).

Conclusion

This concludes the year long series of articles examining a scientific approach to fitness development for orienteering and it is hoped that everyone, regardless of ambition, ability, age or experience has been able to take away something from the series to benefit both their approach to fitness training and to orienteering in general. It is the aim now to continue submitting articles to CompassSport magazine and cover a range of general topics around fitness and training specific to orienteering, and if anyone has particular areas they'd like to see covered, then please let the editor know.

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