ACC SportSmart: Educational Resource

ACC SPORTSMART

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www.acc.co.nz/sportsmart

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INTRODUCTION

The Accident Compensation Corporation (ACC) is committed to reducing both the number and severity of injuries to sports participants. ACC is working with sports organisations to develop and implement injury prevention strategies. ACC SportSmart is the name given to programme resources such as this document and other associated materials, with the aim of ensuring the programme retains a readily identified profile within sport in New Zealand. The programme's overall aim is to minimise the risk of injury for all participants in organised sport.† A benefit of remaining injury-free in sport is the maintenance of optimal performance.

ACC SportSmart

Injury prevention in sport is important as it bears a direct relationship to enjoyment and optimum performance. All coaching policies, educational documents and curricula should have clearly identified and consistent content on injury prevention to help ensure that injury prevention strategies become one of the major elements of coach/trainer knowledge. Awareness of injury prevention strategies, and the resulting changes in injury prevention behaviour when strategies are followed, will help reduce the risk of injury in sport.

Often resources do not directly identify or link many of the areas/factors that help minimise the risk of injury to sport participants. *ACC SportSmart: Educational Resource* aims to overcome this shortcoming by introducing the 10-Point Action Plan for Sports Injury Prevention (figure 1), which outlines key action points†† for sports injury prevention.

The document is intended as a foundation to ensure the same frame of reference is understood and used by all – it is not intended to be the definitive work in sports injury prevention. Numbered references in each section list the related material and resources used to develop the section. Further reading materials are listed in the relevant sections for readers wishing to learn more about a given topic.†††

It is acknowledged that a number of groups who participate in sport have specific injury prevention needs, such as children, women, aged people and people with intellectual or physical disabilities. This document refers to some of the issues that relate to these groups, and includes a list of organisations to contact for more information.††† Other areas such as management systems, marketing and the psychological and social factors involved in sports injury (e.g. the culture of playing on with an injury), although important, have not been the focus for this document.

"It is important to recognise that the causes of sports injuries are usually multifactorial and that a single preventive action or strategy may not be successful in isolation. Rather a combined strategic approach is required to implement a successful sports safety framework that covers all possible situations."[1]

This document is intended for secondary school physical education teachers, tertiary institution tutors and lecturers, and for all national sports and sports training organisations. They are encouraged to integrate its principles into their sports-related education programmes and sports policies. It is also intended for secondary and tertiary students wanting to ensure best practice in their sport or future careers.

ACC SportSmart: Educational Resource has been used by ACC as a basis for a generic family of resources: the *ACC SportSmart Coaches' Kit*, a general information brochure, the Safe in Sport and Recreation website,

the *Presenters' Kit*, five common injury resources (web-based only) and an *Injury Management* brochure.

The responsibility for injury prevention in sport does not lie with any single organisation. Lead agencies (e.g. ACC, national sports organisations, SPARC (Sport and Recreation New Zealand)) are responsible for developing and directing sports injury prevention strategies, while other organisations (e.g. sports clubs, sports trusts, schools) can implement the strategies at the community level and are vital to their success.

† **Organised sport has been targeted for this programme. It is hoped that participants in social sport and recreation will also benefit from the programme in the long term.**

†† **The key areas are educationally and behaviourally focused only. Other areas can be included at a later stage.**

††† **Further information is available from ACC, regional sports trusts, SPARC (Sport and Recreation New Zealand), national sports organisations, Sport Science New Zealand and Sports Medicine New Zealand.**

Useful websites include:

www.sportnz.co.nz
www.paralympicsnz.org.nz
www.sportsmedicine.co.nz
www.halberg.co.nz
www.sportscience.org.nz
www.blindsport.org.nz
www.sparc.org.nz

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1. Australian Sports Commission. ***SportSafe Australia. A National Sports Safety Framework.*** Australia, 1997.

THE 10–POINT ACTION PLAN FOR SPORTS INJURY PREVENTION

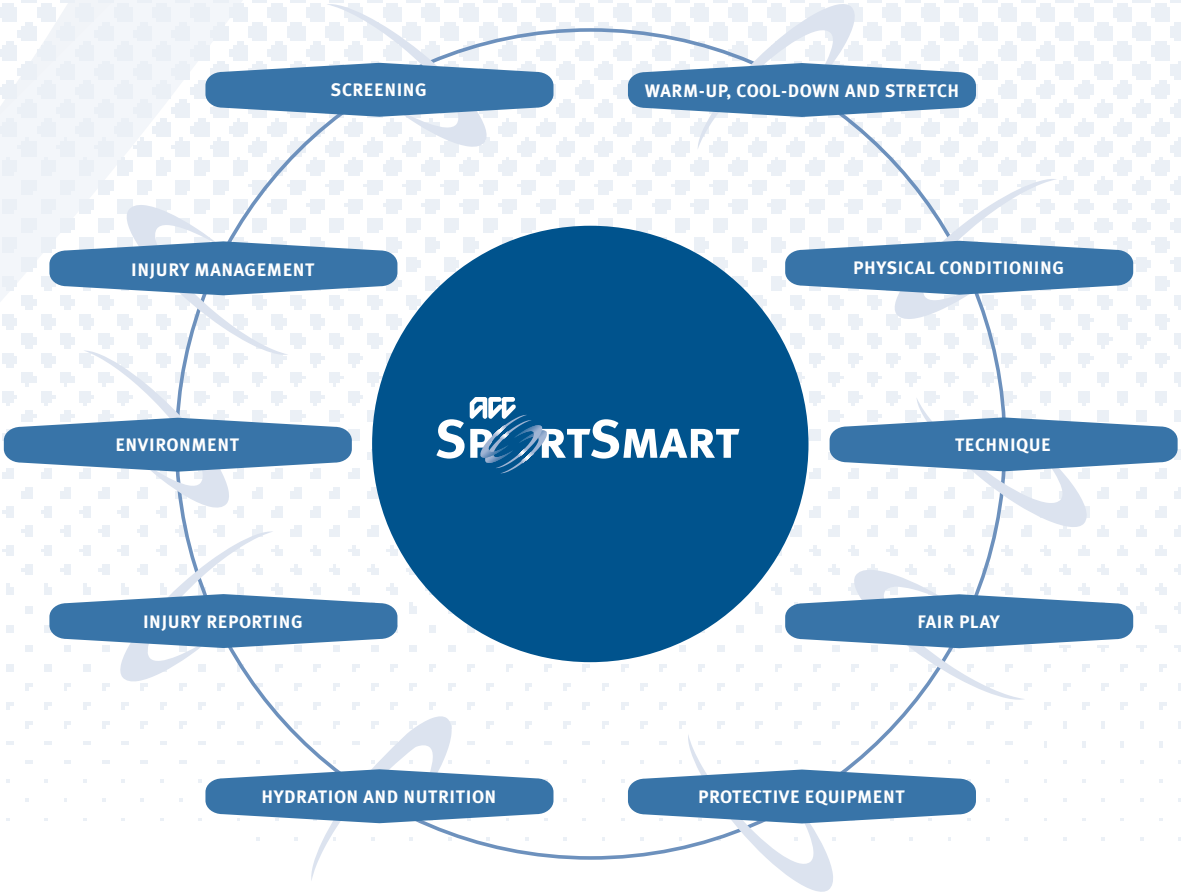

figure 1: ACC SPORTSMART – THE 10-POINT ACTION PLAN FOR SPORTS INJURY PREVENTION

AIMS AND BENEFITS

The Aims and Benefits of Sports Injury Prevention

Sports and physical activities are beneficial to both individual participants and society as a whole, as they offer both better health and enjoyment/relaxation.[2] Such participation does however carry potential risk of injury, which increases with the amount and intensity of participation. Although there are many definitions, a sports injury can be defined as an event that results in a player being removed from play and/or unable to participate in at least one training session or competition after the injurious event.[3]

Injuries result in a cost greater than the obvious loss of sporting time. There can also be the cost of loss of work time and income (even with compensation), the costs of physical disablement and pain, and financial and social costs (including the impact on family and relationships).

Acceptance by players and sports organisations of the importance of reducing the number and severity of injuries has led to increasing attention being paid to injury prevention. The prevention of sports injuries has been organised by van Mechelen[2] into the "sequence of prevention" model as shown in figure 2.

This four-step model emphasises:

1. Knowing about the injury problem
2. Identifying the cause and mechanism of the injuries
3. Implementing preventive measures
4. Evaluating the effectiveness of the preventive measures.

ACC SportSmart describes 10 action points that coaches and players can act on to minimise the risk of injury. They are presented as an action plan so they can be used by coaches and players on a day-to-day basis when participating in sport.

"Injuries are a major barrier towards increased participation in, or maintenance of, physical activity. Removing the injury barrier will help to increase participation in sport and other physical activities. It will also lead to improved health without the impairment of injury and the health costs will be reduced. Overall, there is a significant benefit to the individual and the broad community by reducing injuries."[1]

The 10 points relate to the van Mechelen model. Injury reporting (action point 8) assists in establishing the extent of the sports injury problem (Step 1 of van Mechelen) and in evaluating the effectiveness of preventive measures (Step 4). In order to establish the cause and mechanism of injuries in detail (Step 2), methods of injury recording and analysis need to be robust. Surveys have been done in a number of codes that describe injury incidence, severity and mechanisms.

The other points in the 10-Point Action Plan are the preventive measures (Step 3): Screening, Warm-up, Cool-down and Stretch, Physical Conditioning, Technique, Fair Play, Protective Equipment, Hydration and Nutrition, Environment and Injury Management.

Various components of injury prevention are discussed in *ACC SportSmart: Educational Resource*, including the development of an injury surveillance system and specific injury prevention measures for activities before, during and after sport, e.g. adequate hydration and using appropriate protective equipment.

Injury reporting is an important step in injury prevention – providing important information about the nature and severity of injury, who is injured and in what circumstances (e.g. in a tackle). Sports injury data is needed to guide injury prevention activities and research into reducing the risk of injury in sports,[4] and to enable the effectiveness of injury prevention strategies to be assessed (see figure 2).

Players should undergo screening for injury risk factors before being allowed to participate in sport. This helps to identify individuals at a high risk of injury owing to factors such as incomplete rehabilitation from previous injury, or musculoskeletal

weaknesses. Players must be able to meet the general demands of the activity at all levels if they are to participate with a reduced risk of injury.

The warm-up procedure, incorporating light cardiovascular exercise and sport-specific exercises, primes the body and mind for the sport, which facilitates maximal performance and reduces the risk of injury. After physical exercise players should remember to cool down and stretch. This helps the body recover from the rigours of the activity by assisting with the elimination of waste products, minimising the physical stress caused by stopping activity and relaxing and lengthening the soft tissues.

Effective physical conditioning programmes are needed to ensure no discrepancy between demands and capabilities. The immediate demands of the activity must also be prepared for.

Players should perform their activity with correct technique. Incorrect technique increases the risk of injury and reduces performance. In some circumstances, where the risk of injury is high and the likely consequences severe, players can use protective equipment. To be effective, the equipment should fit well, be comfortable and allow a full range of motion while providing the intended protection.

Foul play is unnecessary and should not be tolerated. At no time should the rules of the game be held in contempt. Coaches and players have a responsibility to maintain discipline and support the officials who enforce the laws of the game.

Optimal hydration and nutrition help players to prepare for and maintain energy during exercise. After sport participation, the recovery process is not complete until players have replaced spent energy and fluids. Encouraging players to consume plenty of water and carbohydrates will prevent excessive fatigue and promote recovery.

The environment in which sporting activity takes place also plays a key role in determining players' risk of injury. Weather conditions, facilities and equipment all need to be carefully assessed before play. Equipment should be appropriate for the players' sizes and abilities. Steps to make the environment safer may include padding goal posts, clearing rubbish or controlling spectators. Where factors (such as the weather) cannot be modified, postponement or cancellation may need to be considered.

If injury does occur, the injury needs to be managed correctly. It needs to be assessed using the T.O.T.A.P.S. guidelines (Talk, Observe, Touch, Active Movement, Passive Movement, Skill Test) as soon as possible to prevent further damage. If further participation is not allowed, appropriate immediate strategies, such as applying the R.I.C.E.D.

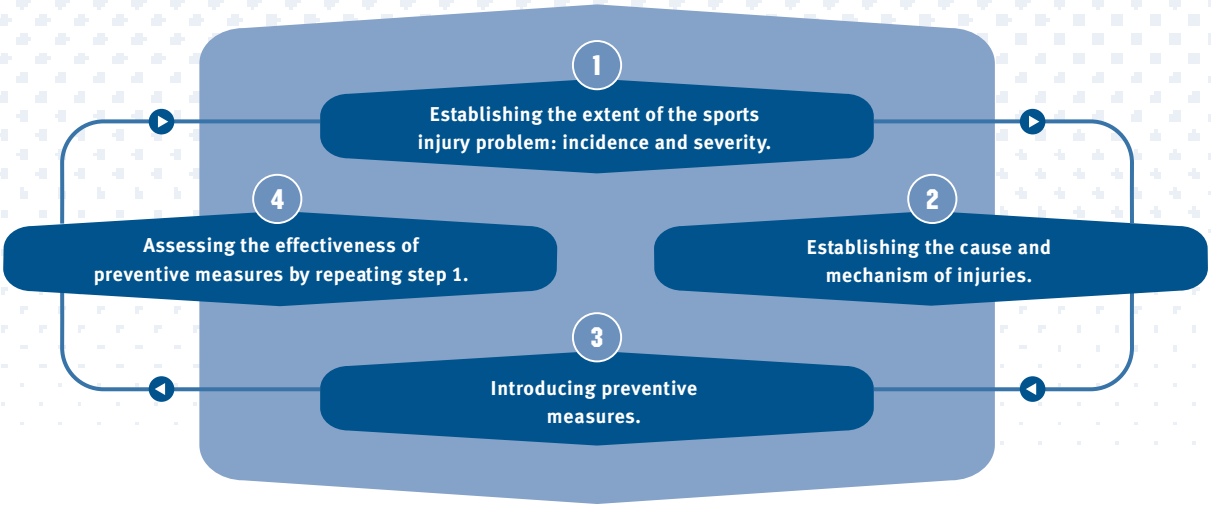

figure 2: A SEQUENCE OF SPORTS INJURY PREVENTION [2]

AIMS AND BENEFITS cont.

procedure (Rest, Ice, Compression, Elevation, Diagnosis) for a soft tissue injury, are recommended. After a rehabilitation programme incorporating appropriate professional advice and care, players can be considered for return to training and competition. This should only be allowed when they have regained enough strength, flexibility, fitness, balance and confidence to withstand the demands of the sport.

Each section provides "best practice" procedures. However, it must be acknowledged that current best practice may change with research and experience.

For further information on sports injury prevention initiatives, see the Australian Sports Injury Countermeasure Reviews and Fact Sheets at: www.general.monash.edu.au/muarc/sport/sport.htm.

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1 SCREENING

Before beginning a sporting season, all players should undergo some process of screening for risk of injury in terms of physical, medical and psychological conditions. The coach has an important role in screening players for injury risk factors, which can be done with some basic screening tests.

This process should take place at the start of pre-season training and be designed to ensure each player is able to withstand the rigours of the sport. Players should be re-screened after an injury to ensure they are ready to return to training and competition. In addition to the screening process that the coach completes, a more comprehensive screening process may be implemented, incorporating all aspects of the players' health. This will require the use of experts such as doctors, sport scientists and physiotherapists.

The Aims and Benefits of Screening

Screening aims to:[1,2]

- Identify players who may have contra-indications or risk factors for exercise or sport participation
- Detect and identify factors that may predispose players to an increased risk of injury
- Obtain baseline physical data (weight, speed, strength, aerobic endurance)
- Assess the effectiveness of a rehabilitation programme on previous injuries
- Assess lifestyle variables that may affect injury risk and/or performance

Screening provides a wealth of information that can be used for a variety of purposes, all of which will benefit the individual players and the team. The team management can use health information to prepare emergency plans in advance (e.g. having barley sugars available for a diabetic player) and to avoid placing at-risk players in danger under certain circumstances (e.g. a player with asthma needs to take precautions when playing in cold or polluted conditions and inflammatory medication may react with an epilepsy drug). Results of physical testing and examination allow the coach to set conditioning programmes that are appropriate for each individual. The players' needs can be assessed and catered for (e.g. fitness level, mobility issues). This information can also be used to measure progress and assess the effectiveness of training. Lifestyle advice and assistance can be provided when necessary. Simple things such as improving a player's diet can help to improve performance and decrease injury risk, as can providing transport to training sessions and games so that a player without transport does not arrive already exhausted. Psychological factors also play a part in injury risk and can be included in the screening process (e.g. observing a player's level of risk-taking behaviour during games or assessing a player's level of confidence in their ability).

Best Practice for the Screening Process

Care must be taken when designing the screening process. The information collected must be relevant to the injury prevention process, and privacy and ethical considerations upheld. The coach also needs to know how they will act on the information collected.

A health questionnaire is a first step in the screening process. For children, it is important that a parent or caregiver completes the questionnaire. Known medical conditions of the players such as asthma, diabetes and epilepsy, and their status (e.g. severity, medication) should be listed as should all previous injuries and the treatment(s) they received. All players should be asked about drug use – prescribed drugs, over-the-counter drugs, nutritional supplements and performance-enhancing drugs.

Examination by a doctor is also beneficial as it may identify previously undiagnosed conditions. The health questionnaire should also include a lifestyle assessment. Establishing details of employment/occupation, transport, living arrangements and dietary practices is of potential value as it may identify a variable that if changed could reduce the risk of injury and/or improve performance.

1. SCREENING cont.

It is also worth taking note of psychological variables that can affect injury risk such as a player's level of confidence or their attitude towards the opposition. Information gathered in the lifestyle assessment can help to tailor training programmes to individuals' needs.

A physical assessment by a trainer or physiotherapist can identify factors that may place players at greater risk of musculoskeletal injury. Strength, flexibility, balance and anatomical and biomechanical abnormalities should all be evaluated. Having a trainer test speed, aerobic endurance, agility, body composition, strength and power can provide baseline physical information. This can be used to assist the trainer with the physical preparation of the team or individual for the season. Good physical preparation is important as it enables players to cope better with the demands of the sport, thus decreasing their risk of injury. Through a thorough physical assessment players' weaknesses can be identified and addressed with appropriate training before the season starts. If a player's physical qualities make them unsuitable for the desired activity they should be helped to identify suitable alternatives. This may be as simple as changing positions or as serious as changing to another sporting code or withdrawing from sporting competition. Table 1 shows examples of screening form components.

A follow-up screening is important to track players' progress and any changes that have occurred since the last assessment. If a thorough pre-season training is completed, a follow-up physical assessment mid-season is appropriate.

It is important to recognise the needs of children in the screening process. Sport for children should be a safe learning experience, reflecting a balance of fun and friendship. Organised sports tend to attract the more outgoing, competitive children. Those with low self-confidence and poor physical skills are less likely to show an interest. A capable coach can recognise these differences in ability at the screening stage and offer appropriate advice and skills training. Encouraging children of all abilities and confidence levels to participate in sport will help them develop lasting high self-esteem and a positive attitude to physical activity and health.[3]

In an ideal scenario, management teams would tailor screening procedures for their particular players. Drawing up a suitable health and lifestyle questionnaire may be the first step. Coaches, medical professionals, players and parents could be included in this design process. A battery of physical tests also needs to be established that will assess all the appropriate variables. Examples of standard test procedures can be obtained from the Sport Science New Zealand *Guidelines for Athlete Assessment in New Zealand Sport*.[4] Once the process has been formalised there has to be a clear understanding of how the information will be used and by whom. Finally, follow-up screening(s) should be scheduled for appropriate times.

This ideal scenario is the upper end of the spectrum of screening and may be beyond the means of non-elite teams and players. However, a less comprehensive procedure will offer reduced but still significant benefits to teams and individual players.

Practical guidelines can be found in the "Screening" section of the *ACC SportSmart Coaches' Kit*.

For information about drugs in sport, including banned substances, visit the New Zealand Sports Drug Agency (NZSDA) website at www.nzsda.co.nz. The NZSDA is a confidential service that protects the identity of the person making an enquiry.

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COMPONENT	EXAMPLES
Health Questionnaire	• Do you suffer from any of the following conditions: asthma, heart disease, diabetes, epilepsy, hepatitis B, other? • Are you on any medication? (please list) • List the injuries that you have had in the past three years and when they occurred e.g. sprained right ankle in middle of last season. • List the treatment you had e.g. on crutches for a while and then sessions with physiotherapist. • Do you remember the name of the doctor/physiotherapist who treated you? (please list)
Lifestyle Assessment	• What is your occupation and how many hours do you work per week? • Do you have reliable transport to and from training and games?
Physical Assessment	• Endurance: beep test score. • Strength: number of press-ups and chin-ups. • Speed: time for 50m sprint. • Flexibility: hamstring, shoulder, and low back.
Follow-up Screening	• Use the same questions and tests as for the previous screening to allow for accurate comparison.

table 1: EXAMPLES OF SCREENING FORM COMPONENTS

2 WARM-UP, COOL-DOWN AND STRETCH

Preparing the body for sports participation by warming up will help enhance maximal performance and reduce the risk of injury. "Warming up" can include light exercise, sport-specific exercises, stretching and even psychological preparation.[1]

A cool-down is a brief period of low-intensity exercise done at the end of a sporting activity. The length of the cool-down will vary with the duration and intensity of the previous activity, but will usually range from 5 to 15 minutes and incorporate some form of low-intensity cardiovascular exercise and static stretching. Although a cool-down period after an exercise session is beneficial to players, it is often neglected.

The Aims and Benefits of Warm-Up

The warm-up aims to prepare the mind, heart, muscles and joints for physical activity. Its benefits include improved performance, greater psychological preparation, and injury prevention. It also offers a significant general health benefit: vigorous exercise started without a warm-up has been shown to place a large amount of stress on the heart and can lead to cardiovascular difficulties such as a heart attack.[1,2]

Warming up helps to prevent a rapid increase in blood pressure and improves blood flow to the heart and working muscles.[2] The increased activity associated with warming up increases muscle temperature and makes the muscles more pliable. A higher muscle temperature also increases the speed and efficiency of the nerve messages and biochemical reactions that cause movement.[1,3] Conversely, a decrease in muscle temperature results in an increase in muscle stiffness and a lowered capacity for work.[1,3] Cold, less pliable and elastic muscle works harder to accommodate a given load and will be more resistant to sudden stretch. Less pliable tissues are also more susceptible to overuse injuries caused by repetitive low-intensity stretching of inflexible tissues.[4]

Warm-up activates and primes the appropriate energy systems, allowing for an efficient use of fuel and lower lactate levels.[1,3] Taking time to adjust to the particular playing conditions also promotes psychological preparation as competitors have time to assess the light, wind and temperature of the environment, the playing surface and surrounding hazards. Warm-up has been shown to improve players' ability to concentrate and visualise their performance.[3]

The Aims and Benefits of Cool-Down and Stretch

Adding a cool-down period may reduce the incidence of injuries. Static stretching in a cool-down also promotes flexibility.

The fast burning of carbohydrates for fuel during intense exercise generates waste products such as lactic acid. Lactic acid in the muscles hinders recovery by reducing strength, slowing the rate of glucose absorption (refuelling) and contributing to muscle soreness, so its quick removal is beneficial, particularly for players who train and compete on consecutive days. Lactic acid can be removed from the muscles and blood most effectively with light aerobic exercise, which sustains the elevated blood circulation. This blood flow carries the by-products of exercise away from the muscles.

Cool-down is important for recreational exercisers as well as competitive players because it helps lower the levels of adrenaline (a hormone) produced during vigorous exercise. Adrenaline that stays in the bloodstream while a player rests can place stress on their heart.[2] Being inactive after exercise can also cause blood to pool, especially in the legs. This slows the return of blood to the heart, which can reduce blood pressure suddenly. This drop in blood pressure often leads to light-headedness and feelings of nausea and discomfort. Continued movement, in the form of a cool-down, is particularly useful after vigorous exercise as it helps

to circulate blood and return it to the heart, reducing the risk of fainting or collapse.

Cooling down slowly also minimises the physiological stress of stopping exercise. The large amount of heat generated during intense exercise must be released if the body is to return to its normal temperature. By moving around, particularly outdoors, the body can gradually release heat into the circulating air.

Best Practice for the Warm-Up Process

The warm-up will be most effective if it follows a set procedure. Table 2 shows a suggested warm-up procedure and an example for soccer.

Performing light aerobic exercise at the beginning of the sporting activity is recommended for starting the warm-up process. Jogging is ideal for most team sports. Static stretching may also be a component of the warm-up (see "Guidelines for Stretching" for the best way to static stretch). Dynamic stretching as part of the warm-up is also a good idea when the sporting activity requires rapid dynamic movements.[5] Dynamic stretching is when muscles are stretched in a progressive, controlled way – gradually increasing the speed of stretch to replicate the sport-specific requirement. It needs to be carefully supervised as it involves exercises that need to be performed with good technique. Sport-specific exercises are also highly recommended in the warm-up as they help to prepare the player for the specific demands of the game.[6]

It is important to remember that adequate fluids need to be consumed during the warm-up.

Best Practice for the Cool-Down Process

Performing light aerobic exercise at the end of the sporting activity is recommended for starting the cool-down process. Jogging is ideal for most team sports as it continues the sporting activity and uses a large amount of muscle mass. Low-intensity cycling and rowing are also good options, particularly after gym training sessions. Again, it is important to keep taking fluids during the cool-down period.

Flexibility/stretching exercises are the other important component of the cool-down. These aim to elongate the soft tissues and provide benefits such as improved joint range of motion. Stretching enhances joint range of motion by increasing the extensibility of the tendons, ligaments and muscles. While not all sporting activities require extreme levels of joint mobility, stretching exercises allow for normal movement patterns and a less restricted motion.

Three stretching techniques are frequently used: static, dynamic, and proprioceptive neuromuscular facilitation (PNF). Static stretching is the most common and is performed by placing the muscle in its most lengthened position and holding it there at least 30 seconds and up to 60 seconds.[7] Under this imposed stretch the muscle and surrounding connective tissues slowly increase in length. Static stretching is the safest type of stretching and the most appropriate for a cool-down (see "Guidelines for Stretching"). PNF stretching uses combinations of alternating contraction and relaxation of the muscle groups. It has been shown to be an effective way to increase muscle length in minimal time and is commonly used by physiotherapists for treating muscle strains.[8] Ballistic stretching, incorporating rapid movements and bouncing, is discouraged for most sports as during these types of movements the muscles have a greater stiffness and resistance to stretch, which does not help in lengthening the tissues.

The safest and most effective time to stretch if trying to increase the length of the muscles and improve joint range of motion is just after exercise.[9] This is because the soft tissues are more elastic and pliable after exercise and are consequently able to be lengthened more safely. For this reason stretches at the end of exercise should be held for a longer time than during the warm-up.

Guidelines for Stretching

Despite the fact that no studies have been able to prove that stretching reduces the rate of injuries,[10, 11] the scientific literature does support the physiological basis for the performance enhancement and injury prevention that result from stretching.[8]

Correct body position is of paramount importance when performing stretching exercises. Proper instruction is required. The following simple guidelines for static stretching should be followed:[8,10]

- Stretch slowly until a comfortable tightening within the muscle is felt (the point of gentle discomfort)
- Hold each muscle in a state of near maximal stretch for a minimum of 30 seconds
- Relax and breathe out as you move into the stretch – avoid holding your breath
- Avoid bouncing
- The correct posture and stretch position should always be maintained and kept within the limits of comfort
- Stretch both sides of the body.

Concentrate on the major muscles, especially those that will have a large demand placed on them and those that have been identified in the pre-season screening process as lacking in flexibility. Stretches may need to be individualised to account for previous injuries[12] and environmental conditions. Contra-indications such as joint instability or ligament damage need to be identified and considered before prescribing stretching exercises.

Practical guidelines on warm-up/cool-down and stretch can be found in the "Warm-Up, Cool-Down and Stretch" section of the *ACC SportSmart Coaches' Kit*.

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