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Sports Injuries with Special Reference to Soccer: Causes, Consequences and Prevention Strategies

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Abstract: Sports injury occurs during a sporting activity caused by overuse, direct impact, or the application of force that is greater than the body part can structurally withstand. Soccer is usually defined as a body contact outdoor game and therefore there is a chance of being injured by the opponents or due to not following proper playing rule or not using protective equipment. To maximize the health benefits of sports and exercise and to minimize the direct and indirect costs associated with injuries, developing and adopting injury prevention strategies is an important goal. Successful sports injury prevention programme requires successful implementation of effective interventions. This paper reviews the main mechanisms and risk factors for injuries to the head, groin, knee, ankle, muscle as well as the evidence supporting various strategies to prevent them. Approaches that have been shown to be successful include: (1) using protective equipment to reduce injury risk, (2) adopting the rules of play, and (3) specific exercise programmes developed to reduce injury risk.

Keywords: Sports Injury, Injury Mechanisms, Injury Prevention, Soccer

1. Introduction

Sports injuries, occurring in athletic activities, are usually refer to any kind of injury that is sustained during an athletic game (e.g. football or rugby) or other sporting activity (e.g. running, cycling or cycling or skiing). They can either result from acute trauma, overuse of a particular body part, application of force that is greater than the body part can structurally withstand, or by direct impact. However, approximately 80,000 to 85,000 fractures occur in the UK each year due to sporting activities (1). In addition to fractures, sports participation can lead to a wide range of other injuries, that may include: muscle and ligament sprains (2); injuries to the central nervous system (3, 4); internal organ damage (5); and concussion (6). Certain groups of people are more likely than others to sustain a sporting injury, including males and those of a younger age (less than 30 years) (1, 7). Some factors that may increase the risk of sports injury may include: inexperience or lower ability (8, 9); decreased strength and endurance (10); aggressive play (11); greater amount of time spent engaging in an activity (8); having a previous injury (10); lack of protective equipment (9); characteristics of the environment (e.g. certain slopes for skiing and snowboarding [9); and less off-season or pre-game training (12). Treatment depends on the type and severity of the injury. On the other hand the physical activity guidelines of the American College of Sports Medicine recommend adults to have regular physical activity for 20-30 min at least 5 days a week to achieve optimum functional capacity, better health (13) and reduce the risk of premature mortality from coronary heart disease, hypertension, colon cancer, obesity, and diabetes mellitus in particular (13). However, former athletes were more likely to have been hospitalized for musculoskeletal disorders (14), and it is also observed in other study that former team sport athletes had an increased risk of knee osteoarthritis (15).

Some injury types are of particular concern, either because they can be severe, such as head and knee injuries, or common, such as ankle sprain or hamstring strain injuries. These represent a considerable problem for the athlete, the team and,

given the popularity of sports, for society at large. Thus, to maximize the health benefits of sports and exercise and to minimize the direct and indirect costs associated with injury, developing methods to prevent sports injuries is a necessary goal. However, it should be kept in mind that the risk of injury will, to a certain extent, always persist when participating in sports.

Soccer is one of the important and world's biggest team sport. Playing soccer is associated with a certain risk for injury and the governing soccer associations have therefore initiated research projects with the aim of increasing player safety .The injury risk in soccer is very high. It has been found in many studies that between 65-91% of male elite soccer players (16, 17, 18, 19) and 48-70%of female elite soccer players (20, 21) will sustain at least one injury during a season.

2. Types of Sports Injuries

Sports injury can be of two types: acute and chronic. An injury that occurs suddenly, such as a sprained ankle caused by an awkward landing, is known as an acute injury. Chronic injuries are caused by repeated overuse of muscle groups or joints. Poor technique and structural abnormalities also contribute to the development of chronic injuries. Some of the more common acute and chronic injury in soccer sports includes:

Ankle sprain – symptoms include pain, swelling and stiffness.

Bruises – a blow can cause small bleeds into the skin.

Concussion – mild reversible brain injury from a blow to the head, which may be associated with loss of consciousness. Symptoms include headache, dizziness and short term memory loss.

Cuts and abrasions – are usually caused by falls. The knees and hands are particularly prone.

Dehydration – losing too much fluid can lead to heat exhaustion and heat stroke.

Dental damage – a blow to the jaw can crack, break or dislodge teeth.

Groin strain – symptoms include pain and swelling.

Hamstring strain – symptoms include pain, swelling and bruising.

Knee joint injuries – symptoms include pain, swelling and stiffness. The ligaments, tendons or cartilage can be affected.

Nose injuries – either blood nose or broken nose, are caused by a direct blow.

Stress fractures – particularly in the lower limbs. The impact of repeated jumping or running on hard surfaces can eventually stress and crack bone.

3. Injury Location

The type and location of injury at the time of soccer playing seems to vary between men and women.It has been observed that most of the injury usually affects the lower extremities of the soccer players (22). The knee (20, 23) and ankle (24, 25) have typically been the most common injury sites in women soccer players, whereas in most recent studies on male players, thigh injuries have dominated (26, 19). Furthermore, injuries to the hip/groin are typically more common in male players.In male players, 65-94% of injuries are acute (traumatic) with sudden onset, and 6-35% are overuse without a specific event causing the injury (19, 27). Similar results have been found among female players, with 69-85% acute injuries and 15-31% due to overuse (20, 21). Common traumatic injuries include contusions, muscle strains (commonly affecting the hamstrings, quadriceps or adductor muscles) and ligament sprains (typically to the ankle andknee joints).In soccer, hamstring strain is one of the most common traumatic injury severely found in male players, which is characterized by sudden accelerations and decelerations, often followed bychanges of direction, and eccentric muscle activity during sprinting and kicking (27, 28, 29, 30). On the other hand, ankle and knee injury are also recognised as traumatic injury mainly found in their female counterpart. On this note, it should be mentioned that anterior cruciate ligament (ACL) injuries are common and serious, and are associated with an increased risk for early osteoarthritis. The majority of ACL-injured athletes will develop osteoarthritis within 15-20 years, regardless of treatment (31, 32, 33). In female youth soccer, up to 40% of all injuries are ankle sprains (34, 35, 36).

4. Injury Severity

It has been found from various studies that injury severity can be described according to six criteria: nature of sports injury, duration and nature of treatment, sporting time lost, working time lost, permanent damage, and cost. Most studies of soccer injuries describe the severity of injury based on sporting time lost. Commonly, injuries are categorised into slight injuries (absence1-3 days), minor injuries (absence up to one week), moderate injuries (absence 1-4 weeks) and major injuries (>4 weeks)(19,21,37,38,39). Some other studies categorising injuries as minor (1-7 days lost), moderate (8-21 days) and severe (>21days)(27,40,41,42).In male soccer players, between 27-59% of injuries are minor, while 12.4-34% are severe (19,27,37,39,42) The injury severity pattern is similar for female soccer players, with minor injuries representing 39-51% and severe injuries 13-22% of all injuries sustained (20,21). Severe injuries commonly constitute joint sprains, typically to the knee, and muscle strains, commonly affecting the hamstrings (19,20,27).

5. Risk Factors

Knowledge regarding risk factors and injury mechanisms are necessary in order to develop effective preventive measures against soccer injuries (43). Risk factors are traditionally divided into two main categories: internal (or intrinsic) athlete related risk factors and external (or extrinsic) environmental risk factors (44).

6. Internal Factors Related to the Soccer Player

Age: The relationship between age and injury risk factors in adult soccer players is contardictory. Some studies found an association between increasing age and injury in general (27, 45) while other studies reported no association between age and injury (21, 25, 39, 46). Players in the older age group (>28 yrs) had a high injury risk (27). Similarly, it has been found in the study conducted on European female soccer players that older female players (≥25 yrs) had a higher injury risk than younger players (<25 yrs) (45).

Gender: There are several studies indicating that female soccer players have a higher risk for ACL injury (31, 32, 33,) and female players also sustain theirACL injuries at a lower age than males. Male soccer players seem to sustain more concussions than do female players (47).

Physical Fitness: Physical fitness is associated with less inhjury occurance. Person with better physical fitness is usually less prone to injury. Fatigue may also be a cause for injury. Fatigue appears more quickly in a player with low physical fitness.

Flexibility: Flexibility is an intrinsic property of the body tissues that determines the range of motion achievable without injury at a joint or group of joints. Flexibility is dependent on the viscoelasticity of muscle, ligaments, and other connective tissue. It has been found in many studies that there is a potential relationship between flexibility and injury risk. Poor flexibility has been found to be a risk factor for hamstring and quadriceps strains (48).

Muscle Strengthening: Muscle strengthening is one of the important parts of pre-seasonal soccer training (strength training). Strengthening the muscle and connective tissues is believed to result in fewer muscle injuries. (49). Reduced muscle strength is considered to be a risk factor for injury.

Joint Laxity/Instability: Generalized joint laxity in female soccer players seems to be a risk factor for injury to the lower extremity (25, 45). It has been found in studies that in male soccer player's knee instability or ankle instability increases risk factor for knee sprain and ankle sprain (27).

Skill Level/Level of Play: There is positive association exists between individual's skill level and performance. Better skill will lead to better performance. The tendency to get injured in lower level players is more compered to their higher level counterpart (50).

7. External Factor Related to the Playing Environment

Warm Up: Warm up is an important criterion in any sports. It is commonly believed that cold and stiff muscles are more susceptible to injury, and warm up could thus act to prevent muscle injury by increasing range of motion, increasing muscle temperature and thereby muscle viscosity, and by muscle relaxation.(51).Another study, providing a plausible link between warm-up and muscle injury.(52)

Playing Surface: One of the important factors regarding soccer injury is the playing surface. It has a great impact on soccer playing. The risk of injury occurrence is more when someone is playing on artificial surface compared to natural grass. (53)

Equipments: The equipment used may also contribute to injury. Failure to wear shin guards may increase the incidence of lower leg injuries (54), and using bad-quality footwear may also predispose to injury. (55) Wearing an ankle orthosis has been found to reduce the risk for ankle sprain in previously sprained ankles.(56) Finally, specific head gear may be of benefit in head-to-head impacts, but are rarely used (57).

8. Common Soccer Injuries

Head injury: Head and neck injuries are common across many sports. Soccer (e.g. American and Australian soccer) is sport where head injuries can result from a fall or from direct contact with sports equipment or opponent, either by chance or through poor individual skills or rule violations. Many reviews (58, 59) clearly show that a head injury is the most frequent reason for hospital admission and the most common cause of death among players. A concussion is an injury to the brain that is usually the result of a blow to the head. Symptoms include disorientation, vision disturbance, headache, dizziness, amnesia, loss of balance, difficulty concentrating, and nausea. A concussion does not necessarily involve a loss of consciousness. Concussions typically result in rapid but short-lived impairment of neurological function that resolves spontaneously. Although most soccer players with head injuries recover uneventfully following a single concussive episode, repetitive mild head trauma may cause cognitive impairment (60, 61).

Prevention: One of the possible approaches has been used to prevent head injury: using a helmet. Helmets or padded headgear are used in many high-energy and collision sports to prevent head injury. Now days, various kind of helmet have been introduced but sometime it fail to provide protection to the player. Research on padded headgear (soft shell helmets) indicates that they do not reduce the incidence of concussion or serious head injury in rugby union football (62).Similarly, data from soccer (63) and Australian rules football (64) suggested that currently available head gear is unlikely to reduce the incidence of concussion.

Groin Strain: A strained groin or adductor muscles — the fan-like muscles situated in the upper thigh that serve to pull the legs together — usually happens when the player suddenly change directions while running. Symptoms include sharp pain, swelling and sometimes even bruising on the inside of the thigh. A strain to the groin muscles may be acute but often becomes chronic in nature. Suffering from persistent groin injuries results in extensive rehabilitation and longstanding pain (65, 66); as an example, 40% of groin injuries in soccer result in more than one week out, and 10% in more than one month out (67). There is clear evidence that a previous strain of the groin muscles on the same side is a strong predictor for a recurrent injury (68,29,69). This may be due to scar tissue

formation in the muscle or tendon or inadequately rehabilitated strength or flexibility (27, 68, 69).Other intrinsic risk factors believed to be involved in groin injuries are reduced adductor strength and flexibility of the hip abductors (27, 67, 70). Decreased adductor muscle strength and an imbalanced adductor-to-abductor muscle strength ratio have been shown to predict groin strain injuries. Reduced flexibility of the abductor and adductor muscles has been suggested as a risk factor for groin strain injuries (27,55, 70).

Prevention: As with most sports injuries, the best way to prevent a groin pull is to stretch properly before exercising. Also, gradually increasing the intensity of the activity rather than jumping into the activity too quickly may help prevent injury, and strengthening the groin muscles can be helpful too. RICE, combined with anti-inflammatory medications, is the best treatment plan. Player should not do anything too strenuous for a week or two after the injury, and when he/she does resume exercising, apply ice to the affected area after the workout until healed. When he/she will feel better, start a stretching and strengthening program.

Knee injury: Typical injuries to the knee are ligament tears of the collateral or cruciate ligaments; these may be associated with meniscal tears, or cartilage and bone damage of varying severity (71, 72). Anterior cruciate ligament (ACL) injuries are common and serious, and are associated with an increased risk for early osteoarthritis. Soccer players are at risk of sustaining such injuries (73, 74). ACL injuries are commonly non-contact in nature and can occur during plant and cut manoeuvres or during landings. Although most ACL injuries are non-contact by definition, the movement patterns often involve perturbation by an opponent, such as body contact prior to the injury (75).

Prevention: Injury prevention programmers have been developed to reduce the risk of ligamentous knee injuries in general, and ACL injuries in particular (76, 72). They are generally based on the assumption that modifying the dynamic biomechanical risk factors can prevent injuries. Successful prevention programs alter the dynamic loading of the knee joint through neuromuscular training. Based on the likely injury mechanisms, it is recommended that soccer players should avoid knee valgus and land with knee flexion to absorb landing forces (76, 75, 72). Training programs that incorporate plyometrics aim to result in safe levels of valgus stress to the knee and alterations in neuromuscular control patterns (76).

Ankle Sprain: Ankle sprains are very common among soccer players. The most common ankle sprain happens when the foot rolls to the outside and sprains the ligaments on the outside of the ankle. The outside of the ankle swells up and throbs, and may turn black and blue around the injury. They are almost inevitable in sports that involve jumping, running and turning quickly; these movements can lead to twisting the ankle and even possibly tearing a tendon or ligament. If weight-bearing is possible on the ankle after a sprain, the ankle probably is not broken. If soccer player feels pain on the inside of the ankle, then it should be x-rayed to rule out a hair-line fracture.

Prevention: Strengthening the ankles by doing exercises such as ankle lifts on stairs, as well as taping the ankle or wearing a lace-up brace can help, but these measures in no way guarantee that it won't be injured if fall hard or make a false movement. Treat an ankle sprain with RICE and anti-inflammatory drugs, but don't rest it excessively for more than a day. To help the ankle heal faster, player should try to move his/her ankle gently to get the circulation going and reduce swelling.

Muscle Pull: Probably the most common soccer injury is a muscle pull, which can happen to almost any muscle in the body, Not warming up properly, fatigue, lack of flexibility, and weakness can cause pull a muscle. Muscle pull can also occur due to overuse or taking a fall. The most commonly pulled muscles are hamstrings. The hamstrings are the muscles behind the thighs; pulling them is painful and can even cause bruising. Muscle pull may occur in many different muscles depending on the sport that are performing.A muscle pulls is caused when a sudden, severe force is applied to the muscle and the fibers are stretched beyond their capacity. If only some of the fibers tear, that is a muscle pull. If most of the fibers tear, that is a muscle tear.

Prevention: The best way to prevent pulling a muscle is to stretch properly before and after exercising, and avoid working out when the player is fatigued and weak. As with most injuries, RICE and anti-inflammatory drugs are helpful, as well as gentle stretches. The universally held treatment for a muscle pull or tear is to apply ice and rest until the pain and swelling subside. The ice relaxes the muscle and helps relieve any spasm. Ice should be applied for about 20 minutes on, then 20 minutes off, as much as possible for a few days. The dull ache of a muscle pull usually disappears within a few days. As soon as tolerable, begins gently stretching
the muscle. A pulled muscle may go into spasm as a reaction to being overstretched. If the muscle fibers are not gradually re-lengthened, the muscle will pull again with return to activity because it will have healed in a shortened state. In general, player can return to action when the injured body part can be stretched without pain as far as the healthy one on the other side of the body. That may take a week for a calf muscle or more than a month for a hamstring pull.

Last but not the least it may be mentioned that the sportspersons must be very conscious about injuries as it can jeopardize their career prospects; soccer players are no exception. Sportspersons may irrespective of their particular nature of sports can get themselves involved in various other types of low or no cost traditional enjoyable exercise modes like yoga, dancing of various forms to keep themselves fit (77,78,79,80,81), without taking undue risk of injuring as in case of rock climbing and like them especially in general fitness programs.

9. Conclusion

In a review of the present literature, we found varying evidence on the prevention of sports injuries especially soccer injury. In spite of many promising efforts on injury prevention, a better understanding of injury risk factors will help us to

optimize current injury prevention strategies, such as exercise programmes, subsequently resulting in fewer injuries, a higher lifelong activity, and lower costs for the public health system. Three strategies that have proved to be successful in preventing soccer injuries are: (1) using equipment designed to reduce injury risk, (2) adapting the rules of play, and (3) specific exercise programmes developed to reduce injury risk. Effective soccer injury prevention requires successful implementation of efficacious interventions. This, in turn, requires knowledge about the implementation context including how people, their attitudes and safety (or risk) behaviors interact with these interventions .In other words, true injury prevention can only be achieved if some form of behavioral change can be invoked in all individuals involved in an soccer player's safety and health, including coach, referee, and the player him or herself. A number of the acute injuries observed may be prevented if players participate in sports within the limits of their personal qualifications, physical prevention, avoid risky situations. Therefore, one of the major goals should be to establish injury prevention habits early in life.

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