Survey

Ultimate injuries: a survey

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Injuries sustained while playing Ultimate at six tournaments between 1986 and 1990 were recorded. Thigh muscle strains, ankle ligament sprains and skin abrasions/friction burns were the most frequent injuries. Factors contributing to injury include pitch state, player fitness and preparation, clothing, 'lay-out' technique, tournament organization and squad size. Reducing excessive playing time, improved preparation by the player, sensible use of protective clothing, and care with pitch selection should all lead to a reduction in the number of injuries.

Keywords: Ultimate, Frisbee®, disc sports, sports injuries

Ultimate is a team sport played with a disc (Frisbee, Wham-O). It was developed by pupils at Columbia High School, New Jersey, USA in 1967. The game was based upon American Football, but changes from these rules soon eliminated running with the disc and the need to achieve 'downs' or make yardage. Further modification has meant that now the only similarity between the two games is the layout of the pitch.

The game spread rapidly throughout the USA and soon crossed the Atlantic. In 1976 the first British Championship was held in Bournemouth. The first International Club Championship was held in Belgium in 1979, while Milan hosted the first European Championship in 1981. Sweden was the venue for the first World Championship and since then World and European Championships have been held on alternate years. As the game, despite being played worldwide, has had virtually no television or press coverage, it is unfamiliar to many people. A brief description of the game therefore seems appropriate.

Ultimate is a non-contact sport played with a flying disc (Frisbee) by two teams of seven players on a pitch 70 yards by 40 yards. At each end there is an end-zone 25 yards in depth. The object of the game is to score goals. The disc may only be moved by passing, as the thrower is not allowed to take any steps. If a pass is incomplete, knocked down, intercepted or lands outside the playing area, a turnover occurs, resulting in an immediate change of possession of the disc. Thus, having gained possession, the player establishes a pivot foot and must pass (around or over the marking defence player) to a team-mate who will be trying to sprint away from markers and catch the disc. Players have a 'stall-count' of 10 s in which to release the disc. A goal is scored when a player successfully passes the disc to a team-mate in the end-zone which that team is attacking.

The spirit of the game is the overriding rule, for there are no referees or umpires[1]. Ultimate has traditionally relied upon a spirit of sportsmanship which places the responsibility for fair play on the players themselves. Highly competitive play is encouraged, but never at the expense of the bond of mutual respect between players, adherence to the agreed-upon rules of the game, or the basic joy of play. Protection of these vital elements serves to eliminate adverse conduct from the ultimate field. Such actions as taunting of opposing players, dangerous aggression, intentional fouling or other 'win-at-all-costs' behaviour are contrary to the spirit of the game and must be avoided by all players. (Although this may initially sound idealistic, if not naive, compared with many sports played today, it is the 'spirit' which makes ultimate a delight both to play and to watch.)

The winner of a game is the first team to score 21 (winning by two clear goals). As games may last for as long as 2 h (unless the game is 'time-capped'), substitution of players from a team squad (usually about 17–20 players altogether) may take place between points.

Ultimate, then, is a team sport which fulfils all the 'Olympic' requirements of a sport, i.e. skill, fitness and sportsmanship. As it involves many potentially harmful manoeuvres, such as twisting and turning, sprinting, several players jumping simultaneously for a disc, or diving full length for a low disc (a 'lay-out'), there is ample opportunity for injury.

Materials and methods

Injuries received at the following tournaments were documented:

1. 1986 World Championships (all players), Colchester
2. 1987 European Championships (UK squad), Germany

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3. 1988 World Championships (UK squad), Belgium
4. 1989 Mokum Memorial (all players), Amsterdam
5. 1989 European Championships (UK squad), Denmark
6. 1990 World Championships (UK squad), Norway.

The World and European Championships were each held over 6 days. The Mokum Tournament lasted 4 days. Teams played between one and three games per day. The UK squads were made up as follows:

1. Masters – less than 30 years old, either sex
2. Open – any age, either sex
3. Women – any age
4. Junior – less than 18 years, male.

Over the 4-year period about 1000 players were 'available for injury'. The author and a physiotherapist were at the pitch-side for each game. Treatment consisted of non-specific massage, frictions, manipulation and other physiotherapy techniques, strapping, dressings, suturing, injections, as well as general medical advice. In Denmark, ultrasound and laser were also available. Only injuries dealt with by the author or the physiotherapist were recorded. It was not possible to calculate injury rates relative to playing time due to the great variation in time spent on pitch by individuals and varying lengths of matches.

Results

During the 4-year period studied, there were 485 injuries. *Figure 1* and *Table 1* show the distribution of injury by anatomical site, lower limb injuries predominating (66.6%). The lower limb injuries bear examination in greater detail (see *Figure 2*). The most common injury involved a strain of a thigh muscle). There was a fairly even distribution through the various muscle groups: rectus femoris, 19; vastus medialis, 2; vastus lateralis, 2; hamstrings, 22; adductors, 16; ilio-tibial tract/tensor fascia lata, 8.

Of these injuries, 60% were classified as moderate or severe, requiring curtailment or cessation of play. The pattern of knee injury is quite different to many sports (see Discussion) with bursitis and 'overuse' injuries predominating. *Table 2* shows the injuries in greater detail. Damage to the skin is common in sport, but the proportion of friction burns in ultimate is high (68%; *Figure 3*). A study of friction burns, grazes etc. by site reveals the vulnerable parts of the body (*Figure 4*).

Bursitis comprises only 4.3% of all injuries, but 86% were classified as moderate or severe. Distribution by site (*Figure 5*) shows a pattern that links with skin injuries (see Discussion).

It might be expected that attempting to catch a hard plastic disc at speed would result in many hand injuries but in fact injury to the hand only provided 5.7% of total injury. Discounting one abrasion and one case of eczema, 26 injuries are left. Looking specifically at the digits and metacarpals, 15 (58%)

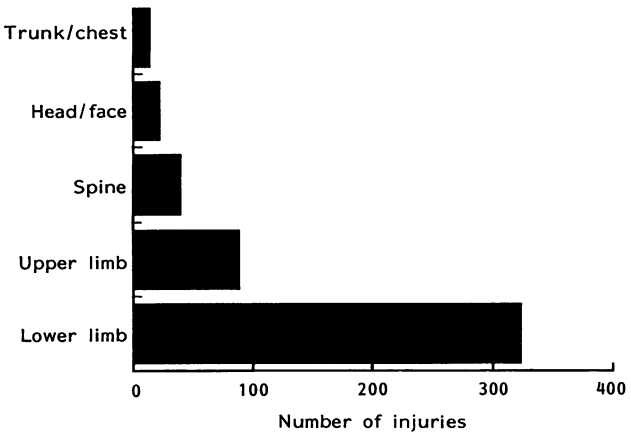

Figure 1. Total injuries

Table 1. Injury distribution by site

Site	*Total*	*Type of injury*
Adomen	4	Muscle strain (4)
Chest	9	Bruises (9)
Head	7	Concussion (6), contusion (1)
Face	15	Bruises (13), laceration (2)
Neck	10	Cervical spine (6), muscular (4)
Back	29	Thoraco/lumbar (19), muscle strain (8), sacroiliac joint (1), episacroiliac lipoma (1)
Upper limb		
Shoulder	22	Rotator cuff lesion (13), acromio-clavicular joint strain (3), bruises (3), bursitis (2), subluxation (1)
Upper arm	1	Triceps strain (1)
Elbow	23	Skin – friction burn (13), olecranon bursitis (5), bruises (3), sprain (2)
Forearm	6	Skin – friction burn (4), tenosynovitis (2)
Wrist	8	Sprain (5), bruises (3)
Hand	28	Bruises (14), sprains (12), skin – miscellaneous (2)
Lower limb		
Hip	10	Muscle strain (5), skin – friction burn (2), bursitis (2), ligament strain (1)
Thigh	103	Muscle strain (70), intramuscular haematoma (15), skin – friction burn (12), bruises (6)
Knee	73	Skin – friction burn etc. (20), non-specific effusion; sprain (14), ligament injuries (12), bursitis (12), bruises/non-specific pain (9), miscellaneous (6)
Shin	18	Anterior compartment, bruise/haematoma (10), medial tibial syndrome (4), stress fracture of tibia (2), skin – friction burn etc. (2)
Calf	30	Muscle strain (11), Achilles tendon strain (7), para-Achilles tendinitis (6), intramuscular haematoma (6)
Ankle	59	Ligament strain (53), bruises (2), tendon strain (2), fracture – fibula (1), skin – laceration (1)
Foot	30	Bruises/sprains (17), blisters (7), tendon strain (3), stress fracture (2), great toe – paronychia (1)

Table 2. Knee injuries

Type of injury	*No.*
Skin (friction burns, grazes, etc.)	20
Non-specific sprain/effusion	14
Patellar bursitis	12
Bruises, etc.	7
Medial ligament strain	5
Lateral ligament strain	4
Patellar tendinitis	2
Anterior cruciate rupture	2
Posterior cruciate rupture	1
Lateral meniscus cyst	1
Lateral meniscus tear	1
Posterior capsule strain	1
Ilio-tibial tract bursitis	1
Patellar subluxation	1
Retropatellar syndrome	1
Total	73

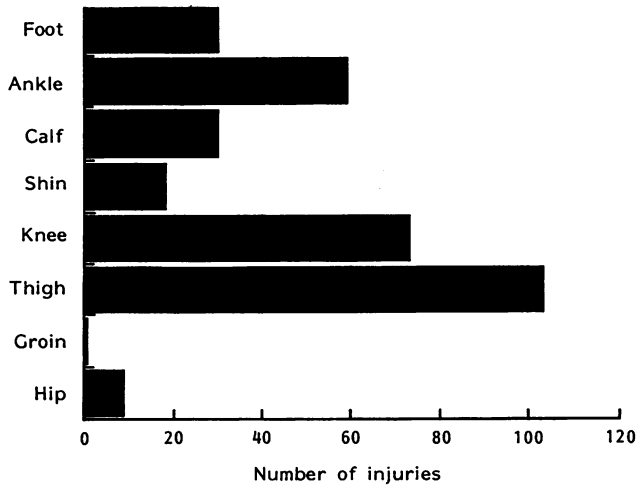

Figure 2. Injuries to lower limb

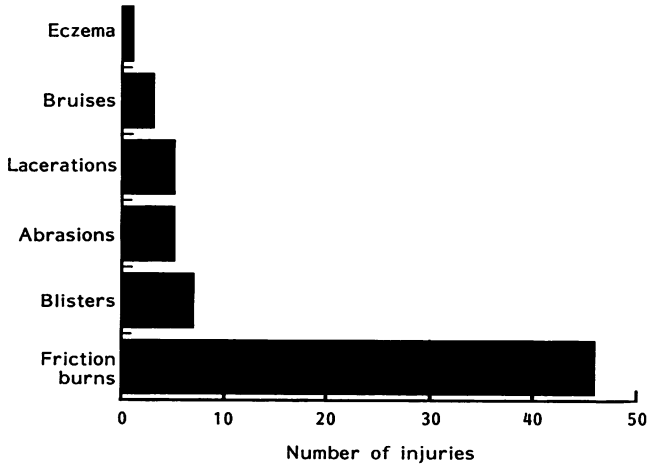

Figure 3. Total skin injuries

involved the fifth metacarpal or digit (see Discussion).

Facial injuries, including the two lip lacerations, were mostly due to being hit by a disc. Head injuries occurred as a result of collision between players. Ankle injuries provided 12% of all injuries and of these, 44 (75%) were lateral ligament strains. Medial ligament injuries are uncommon, but have been reported previously[2].

Discussion

It is difficult to find another sport with which to compare ultimate. Rugby football is a game in which there is much running and deliberate diving, but this is a contact sport and its pattern of injuries[3,4] is generally more severe (e.g. fractures, torn ligaments etc.) than for ultimate (*Figure 6*). There is a great deal of running involved when playing ultimate, but the injury pattern does not compare with distance running[5]. The following factors appear to have the greatest influence on ultimate's injury pattern: (1) degree of preparation by individual; (2) organization of tournament and squad size; (3) state of the pitch;

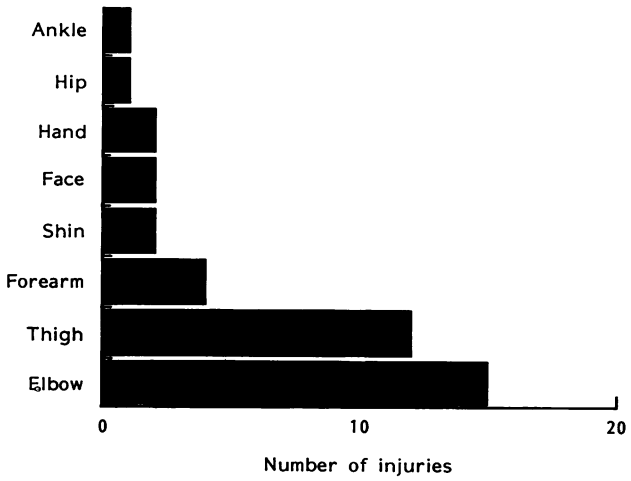

Figure 4. Injury to skin

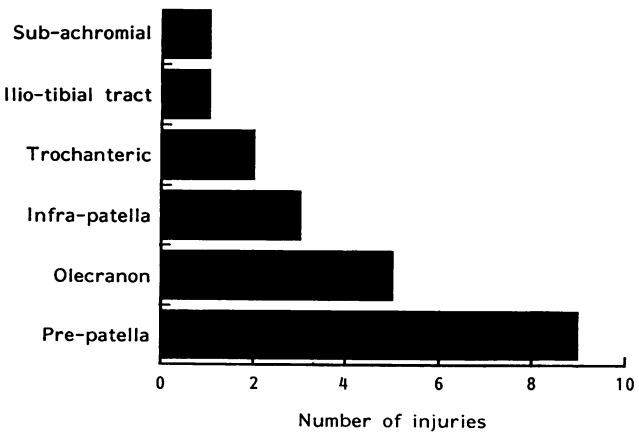

Figure 5. Bursitis

Figure 6. 'Skying' for a disc – ultimate is a non-contact sport but there is ample opportunity for accidental collision

and (4) ability to lay-out correctly; (5) protective clothing.

The nature of the game, involving much sprinting and cutting (sudden change of direction at speed), will inevitably lead to muscle strains in the lower limb. Other factors, which are already well documented[6], will increase this possibility. Individuals who have not trained properly before a tournament, who have failed to warm up and stretch before play and who have not ensured that their diet and fluid intake is suitable, are more likely to sustain injury. It has been most noticeable that as the UK squads have begun to prepare more carefully not only for each tournament, but also for each game, injuries generally have been less severe.

Unfortunately, if squads are too small, players are by necessity required to play for too long in each game; fatigue develops and the injury rate therefore rises. The 1986 World Championship was organized on a 'round-robin' basis, requiring teams to play up to three times a day (up to 4.5 h of demanding play each day). Such excessive play undoubtedly contributed to a high injury rate. Championships now use a different schedule which results in fewer games per team. Excessive play contributed not only to muscle strains but also to overuse effusion of the knee and increased propensity to ankle sprains. It is not possible to give an accurate figure but a significant proportion of players had clearly not undertaken adequate rehabilitation of previous ankle sprains and were thus more susceptible to further injury.

Not all pitches were of an adequate standard. Hard, dry pitches predispose to ankle injuries and friction burns. Stony pitches predispose to lacerations, etc. One pitch appeared to be lush, but was based on a sandy soil. Rapid cutting took out huge divots which could not be replaced owing to the sandy base and deep holes were left. This situation contributed to a number of ankle and knee ligament injuries.

Laying-out (diving) is a skill that requires not only courage and determination, but also technique. A lay-out is usually performed at speed – a dive at the end of a run. The legs should be flung out straight keeping the knees together, while the arms are fully extended, reaching out to catch the disc (i.e. the whole body horizontal and parallel to the ground (*Figure 7*)). As the disc is caught, the whole body rolls in a twisting motion as it hits the ground. Thus impact is taken on the extensor surface of the forearm, posterior aspect of the upper arm and shoulder, lateral aspect of chest wall to posterior-lateral aspect of the buttock and thigh. The full force of the impact is thus dissipated. A poor lay-out usually finds one knee low and partly flexed and/or one or both elbows partly flexed. The player therefore lands directly on to the knee or elbow and sustains a friction burn or develops bursitis. Poor technique may also result in landing too violently on the hand, invariably landing directly on to the ulnar aspect, thus injuring the fifth metacarpal, phalanges, metacarpophalangeal and interphalangeal joints – instead of rolling on impact with the ground (*Figure 8*). The overall pattern of knee injuries reflects the 'overuse' aspect of the game (non-specific strain, etc. account

Figure 7. A well performed scoring lay-out – the player is almost horizontal and is in a good position to 'rotate' as he lands

Figure 8. This poorly executed lay-out achieved a dramatic defensive block but at the cost of a fractured left distal radius

for about 25% of injuries), and the hazards of laying-out (friction burns, bursitis, bruises etc. about 55%), rather than the more violent injuries that are usually associated with contact sports (ligament damage etc. about 20%).

The vulnerable parts of the body in terms of ground contact were clearly the knee, thigh, elbow and forearm. The wearing of knee and elbow protectors and 'long shorts' or cycle shorts would significantly reduce the number of lacerations, friction burns and cases of bursitis. Unfortunately, many players avoid such simple protective measures, claiming that it inhibits their throwing technique. None the less, progress has been made over the last 2 or 3 years in imparting information to players about preparation and protection, both through 'pitch-side' attendance and advice, and via articles in the official magazine of the British Ultimate Federation – *Ultimatum.*

Conclusion

Ultimate is a relatively new, but rapidly developing, sport. The pattern of injuries sustained over a 4-year period can be linked to the running/cutting and laying-out which are an integral part of the game. Other influencing factors include poor preparation for play, state of the playing surface, fatigue (nature of tournament and squad size) and lack of protective clothing. Clear guidance can be given to the British Ultimate Federation (BUF) so that standards can be set with regard to playing surfaces and tournament organization. Advice is also available to players via the BUF magazine *Ultimatum*[7] and a booklet[8] with regard to preparation and fitness, footwear, clothing and the need specifically to practice the technique of laying-out. Attention to these details should help to reduce the injury rate in this new, exciting and immensely enjoyable sport.

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