(a) "War". describes the practice used by the 1960 Belgian National Coach to promote aggression in contesting rebounds and tolerance to physical contact. In this practice the ball is tossed at the basket by the coach to initiate the play, underneath which a group of players are assembled. Each player attempts to gain possession of the ball and score while the others prevent his doing so. Play is continuous, rules concerning travelling and dribbling violations are not enforced, and physical contact is allowed. The practices at times become so aggressive that the coach has to part players whose tempers run high.

(b) "One on one" practice, a dribbling attacker attempts to go past a defender and score, an exceedingly common occurrence in competition. The coach places an emphasis on the attacker "taking his opponent on", and the defender is allowed more than normally permissible contact and provides a strong physical challenge.

(c) Conditioned practices ensure that a team when scrimmaging plays the game in the extremely aggressive fashion, a coach may make additional rules or conditions.

(d) "Punishment" maintains motivation of players in training; if players or teams do not maintain certain standards they receive punishment in the form of extra physical work, or in being withdrawn from scrimmages for a period. During the practices described more injuries may occur than in competitive match-play as the training period is longer and there is a greater incidence of contact between players.

The players. Players recently injured or who are recovering from injury are anxious to play, either to maintain or regain their position in the team. Such players may attempt to conceal the extent of their injuries. Additionally the "hard" approach by the coach produces an unsympathetic attitude to injuries on his part. This attitude may be replicated in the non-injured players. It is not unusual for a player to play through a full competitive season with a recurring injury. Playing might be the reason for the recurrence. Athletes learn to live with such injuries and it may be that they are willing to pay the price of a deteriorating condition for the current self-fulfilment the game can bring.

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INJURIES IN BADMINTON*

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Physiological studies have lead to the classification of badminton as moderate activity. Shephard (1971) cites a value of 6.3 kcal/min as the energy demands of this game while Yamaoka (1965) obtained a level of oxygen consumption 6.6 times the resting metabolism in singles play. It is likely that the level competitive badminton players play and practise exceeds the level found by these investigators using University students as subjects. Additionally work is intermittent, interspersing high intensity activity with short rest pauses. The activity of the game involves abrupt jerking movements and staccato footwork to cover a singles court area of 20' x 17' before the shuttle hits the floor. Another factor which adds to the physical demands imposed by badminton is that strokes are often played from extreme postural orientations. Though stress is induced in a number of sites, the main problem areas are the legs, and in the playing arm and shoulder. It is essential to increase strength and mobility both to protect from injury and to enhance performance.

*This material was presented as a demonstration on court.

From experience garnered in my international playing and coaching career the major injuries caused by badminton are:

Tennis elbow — usually prevalent with players who have hitting technique problems, often caused by incorrect grip or by holding the racket too tightly, which is sometimes due to having too small a handle.

Anterior shoulder muscle strain — usually deltoids. These problems are precipitated by the fatigue of practices that are too long (especially in young players), attempts to smash too hard and incorrect hitting technique particularly in overhead backhand strokes. Constant strain on the shoulder joint causes bursitis, tendonitis and myositis of the shoulder muscles, tendons and bursae (Izen, 1971).

Achilles tendon tears — caused by the constant need to move violently off the toes. The severest of these injuries tend to happen at the end of a hard game when players are tired and on harsh surfaces, in particular synthetic rubber courts which do not allow any sliding to occur.

Hamstring strains — caused by over exertion in splits-type 'fencers' lunges. Details of training routines for prevention were described by Dornan (1974). Physiotherapists could contribute in the design of flexibility exercises for the hamstrings.

Ankle sprains — caused by rotating the ankles (usually externally) when falling sideways or landing awkwardly after jumping for an overhead shot when off-balance. Dornan (1974a) has described training methods to help prevent ankle injuries, and the use of a wobble-board for developing strength and mobility in this region, has also been suggested.

Knee joint sprains — caused by the requirement for sudden rotational movements with the feet stabilised. Muscles and tendons around the knee are frequently strained by the constant jarring and driving off of the leading leg. This may be often due to weakness in the quadriceps. Torn cartilage is a common complaint.

Groin strains — caused by the necessity for wide lunging movements.

Lower back injuries — including slipped discs and soreness around the sacral vertebrae. These may be caused by a combination of sudden and extreme spinal extension and flexion as well as jerking rotational movements with legs wide apart.

Severe adductor soreness — caused by 'deep' lunging movements particularly into the back corners of the court. Specific half-lunges in training drills and half-squats in weight-training, with the heels on the ground and the hips not allowed to sink below the level where the femur is parallel to the ground are recommended.

Friction burns and grazes — due to synthetic surfaces these types of problems are increasing. Bruises and fractures are uncommon. 'Clashes' with partners in doubles is seen only at the lower levels of play and are due to lack of positional and tactical sense.

Eye injuries — caused when the shuttle hits the eye either hit over the net by an opponent or by a partner in doubles play when the player concerned is at the net and turns around to see the play behind him. These incidents are infrequent and injury is not serious.

Bruised heels — caused by the repetitive banging down of the 'leading' foot. This highlights the need for a shoe specially designed for badminton. Shoe manufacturers have so far been reluctant to pursue this design need.

Badminton requires a combination of strength, speed and stamina. Training of aerobic and anaerobic mechanisms is advised. At a high level of performance intensive specific conditioning is recommended. For younger players Beggs (1973) concluded that there is little value in embarking on intensive training before the adolescent growth spurt. Beggs' report of the death on the badminton court of a 19 year old girl found to have mitral stenosis underlines the importance of medical screening. This would particularly apply in sedentary adults taking up badminton for recreation. Apart from medical "screening" appropriate medical attention to injury is important. Who to go to is not always obvious to the injured player.

SUMMARY

Injuries to the arm and shoulder in badminton are largely due to faulty technique while leg and back injuries are caused mainly by lack of strength or mobility. Increased liaison between coaches and physiotherapists in particular, will help improve performance and prevent injuries.

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SOME RISK FACTORS IN SELECTED TRACK AND FIELD EVENTS*

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Track and field athletics embraces a variety of running, jumping and throwing events. From this heterogeneous group four events have been extracted for discussion — hurdling, sprinting, broad-jumps (long and triple), and distance running. My intention is to pinpoint some risk-factors current in training and competition and describe preventive aspects of typical training regimes.

RISK FACTORS

Hurdling

- i) Bruising of the shin of the leading leg in clearance if take-off is too near the barrier.
- ii) Ankle sprain from imbalanced landing with the foot in an inverted position and inwardly rotated. Damage is usually to the lateral collateral ligament (O'Donoghue, 1962), though less frequently avulsion of the tip of the lateral malleolus is found (Miller, 1971).
- iii) Grazing of the medial aspect of the knee of the trailing leg. Some coaches employ protective pads on the hurdler's knee and ankle, though this may encourage imperfect techniques.
- iv) Tear of the adductor magnus or gracilis muscles caused by imbalanced clearance and over-stretching, resulting in landing on the leg with the thigh in forced abduction.
- v) Tear of the medial belly of the gastrocnemius muscle resulting from sudden dorsiflexion with the knee extended. This can occur when the trailing leg hits the hurdle, the leading leg is short and the foot is abruptly jammed into dorsiflexion.
- vi) Spiking wounds — mostly self-inflicted in adjusting to errors in stride pattern.

*This material was presented as a lecture/demonstration in an indoor gymnasium.