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SPORTS INJURIES IN ADOLESCENT BOARDING SCHOOL BOYS

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ABSTRACT

A survey is presented of 346 sports injuries admitted to the Eton College Sanatorium between 1971 and 1982. The incidence of injury was lowest in 13 year olds perhaps because of their lighter weight. The injuries were classified into four groups — minor head injury, soft tissue injury, fractures and dislocations, and eye injury. Football caused 75 per cent of all injuries except eye injury where it accounted for only a third. Comparison of the incidence of injury at the three types of football played at Eton — Rugby, Association and Eton — showed Rugby football to be the most dangerous and Eton football the safest game. Advice on the management and prevention of injury is given.

INTRODUCTION

Sport has always played an important role in boarding school education and sports injuries form a large part of the school doctor's work. At Eton College where there are nearly 1300 boys aged 12 to 18 years 40 per cent of boys suffer at least one injury each year, the majority being trivial. Two thirds of the injuries occur at sport, one in eight of these requiring admission to the Sanatorium for observation or treatment. The Sanatorium contains 18 beds, a portable X-ray machine and an operating theatre for casualty work. The staff comprise three fully qualified nurses and a part-time physiotherapist.

METHOD

Between 1971 and 1982 all the admissions for injury under the author's care were registered, totalling 480, of which 346 (72 per cent) were due to sports injury. A survey was made of the sports injury group noting the boy's age, type of injury and sport at which it occurred. A careful enquiry was made into the mechanics of the injury. This group contained all the boys with more serious sports injuries with the exception of a very few boys who were admitted direct to hospital with severe concussion, major fracture or important eye injury and who were discharged either home or back to school thus avoiding the Sanatorium.

RESULTS

Age Incidence

The age incidence is shown in Figure 1. The low incidence in the twelve and eighteen year olds is commensurate with the small numbers in these age groups, 0.5% and 1.5% of total population respectively. The total numbers of each of the age groups thirteen to seventeen are comparable and the incidence is uniform except in thirteen year olds where it is low. This may be due to the fact that boys are lighter at this age thereby suffering less injury on impact at body contact sports.

Classification of Injuries

The 346 sports injuries were classified into four groups (Table I) which will be described in turn.

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Fig. 1: Age incidence of 346 sports injuries.

Table I Classification of 346 sports injuries.

Minor head injury	126	(36%)
Soft tissue injury	124	(36%)
Fractures and dislocations	78	(23%)
Eye injury	18	(5%)

Minor Head Injury

Minor head injury accounted for 126 admissions (36 per cent of the total). Minor head injury is defined as an injury causing a post traumatic amnesia of less than twenty-four hours or requiring admission to hospital for less than seven days (Field, 1976). Boys with minor head injuries were divided into two groups: those who had been unconscious and those who had not been unconscious. The diagnosis of concussion was restricted to those cases where loss of consciousness, however brief, followed immediately after a head injury and for practical purposes if a boy could not remember the blow to his head he was considered to have been concussed (Potter, 1973). Boys who exhibited symptoms and signs resembling the post concussional state but who had not been concussed, as defined

above, were diagnosed as suffering from subconcussion (Briscoe, 1978). The incidence of minor head injury caused by sport is increasing. Between 1965 and 1977 0.6 per cent of boys per year were affected rising fourfold to 2.5 per cent from 1977 to 1982. There are several possible reasons for this. First the number of cases occurring at all forms of football has increased partly due to the rising popularity at Eton of Rugby football which is well known to produce more head injuries than Association football or Eton football and partly due to more aggressive play by the participants at all forms of football. Secondly, referees, masters and housematrons have become more aware of the symptoms and signs of minor head injury and the need for medical attention. Thirdly, a concrete outdoor and more recently an indoor swimming pool have come into use instead of the River Thames and finally new sports such as judo have been taken up increasing the opportunity for head injury.

Three quarters of the cases of minor head injury occur at the three types of football played at Eton (Table II). At Association football an opponent's head is the commonest cause, especially in a heading duel. At Rugby football an opponent's boot is a frequent cause. Elbows, knees and fists as well as the ball itself or the ground may be the cause of injury at all types of football. On many occasions the precise cause is not known because the boy cannot remember the blow and in a fast moving game it is difficult for the referee or other players to see what happened. Minor head injury also occurs at other sports. When batting at cricket one boy received a ball full toss on his head; another was hit by a ball which popped up when he played forward and others were hit missing hook shots. A close in fielder was struck on the head, another dived, misjudged the bounce and was hit. A wicket keeper was floored by a classic "wicket keeper killer" shot. Another wicket keeper who had successfully caught a snicked ball in his exuberance threw it high in the air as is the current fashion but lost sight of it and it fell on his head concussing him! At gymnasium sports boys fell on to their heads off the rings or off ropes or as a result of a successful manoeuvre by their opponents at judo. In the swimming pool boys hit their head on the bottom diving in the shallow end illegally or on the side swimming under water. In court games fives balls and rackets balls have caused head injury and one boy concussed himself running into the back wall at squash. A boy fell in the steeplechase and was concussed, another fell climbing over a fence beagling and hit his head and a third was getting a boat off a shelf in the boathouse when he lost his balance and the boat fell on his head knocking him out. For Rugby football, the majority of senior boys wear mouthguards, and all players are encouraged to do so.

Table II Causes of 126 minor head injuries.

	Concussion	Subconcussion	Total
Rugby football	15	24	39
Association football	8	24	32
Eton football	10	15	25
Cricket	3	7	10
Gym sports	3	7	10
Swimming	2	2	4
Court games	2	1	3
Others	2	1	3
	45	81	126

Soft Tissue Injury

Soft tissue injury accounted for 124 admissions (36 per cent of the total). The injuries were classified according to site (Fig. 2). The great majority occurred to the leg. Among these injuries were 30 sprained ankles many with effusions and 23 knee injuries mostly medial or lateral ligament strains with traumatic effusions; there were two cases of haemarthrosis, one posterior cruciate injury and one cartilage injury. Haema-

Fig. 2: 124 soft tissue injuries.

toma of the quadriceps was quite common and there were some cases of torn hamstring and calf muscle. The trunk injuries consisted of bruised ribs and back muscles. There was one unusual injury which occurred at rowing. One boy had the misfortune when rowing bow to be rammed by the prow of a boat going in the opposite direction. He suffered an extensive graze over the lower right side of his back and right thigh. There was one case of ruptured spleen. This injury occurred at Eton football when a boy was barged shoulder to shoulder and his left elbow was forcibly pushed into his left lower ribs. Over the course of an hour he complained of left shoulder tip pain, dyspnoea and left hypochondral tenderness, and later at operation a ruptured spleen was removed. The head and neck injuries consisted of strained necks and bruised heads and one bruised larynx. This caused laryngeal spasm for a few minutes which gradually settled without the need for active intervention. There were very few arm injuries all being bruises. Three quarters of the cases of soft tissue injuries occurred at the three types of football (Table III).

Table III Causes of 124 soft tissue injuries.

Association football	52	78%
Eton football	30	
Rugby football	15	
Gym sports	8	
Cricket	6	
Athletics	5	
Court games	5	
Others	3	

Fractures and Dislocations

Fractures and dislocations accounted for 78 admissions (23 per cent of the total). There were 71 fractures, 20 of them being fractured noses (Table IV) caused by knees, heads, boots, elbows or a fist at football and by balls at cricket. The 33 arm fractures consisted of 19 of the radius and/or ulna (including 13 Colles' fractures), seven of the hand, six of the clavicle and one of the humerus. Almost all of the forearm fractures were caused by falls on to the outstretched hand; two resulted from an opponent landing on the victim's arm on the ground; one occurred as a boy, who was vaulting over the long box in the gymnasium, took his weight on his arms and

felt a crack in his left forearm. Fractures of the hand commonly occurred in goalkeepers at Association football and as a result of collisions in the swimming pool. Almost all the fractured clavicles were the result of a boy falling in football and another boy landing on top of him.

The famous Eton Wall Game only led to one fracture in the whole period surveyed, as the game is slow moving and injuries are rare.

Table IV Sites of 71 fractures.

Nose	20
Arm	33
Leg	17
Neck	1

The 17 leg fractures consisted of one avulsion of the anterior superior iliac spine in a boy starting a sprint at Rugby football; one fractured femur from a collision at Association football; one chip fracture of the posterior surface of the patella caused when it was dislocated; two fractures of the foot and 12 tibial and/or fibular fractures. The latter divided into two fractures within the knee joint, five involving the ankle joint, four fractures of the tibial shaft and one of the fibular shaft. Fourteen of the 17 leg fractures occurred at football.

The fracture dislocation of the neck occurred at Eton football. It was at the C2 level miraculously without neurological deficit.

There were seven dislocations consisting of two of the shoulder both in the same boy, one of the elbow, one of the big toe and three of the patella. Including the fracture dislocation of the patella mentioned under fractures there were in all four dislocations of the patella. Three occurred when a sudden contraction of the quadriceps was made with the knee slightly bent, pushing in the bully (or scrum) at Eton football, weight lifting and during the first stroke in a rowing race.

Eye Injury

Eye injury accounted for 18 admissions (5 per cent of the total). There were ten cases of commotio retinae, one of which later developed posterior lens opacities; four of corneal abrasions, two of ciliary spasm, one of bruised eye muscles and one of retinal vessel spasm caused by a blow on the left eyebrow at football resulting in temporary loss of vision in the lateral half of the visual field of the left eye.

Balls of various sizes were responsible for two thirds of the injuries. Squash balls, fives balls and footballs each accounted for three injuries, cricket balls for two and a tennis ball for one. A squash ball from the nature of its size and consistency may compress the eyeball and cause very serious injury; a fives ball though slightly bigger and hard is also capable of serious damage. Surprisingly footballs may compress the eyeball and caused three cases of commotio retinae one with retinal haemorrhage. At cricket batsmen who mis-hook, the ball glancing off the top edge of the bat, and wicket keepers who are unsighted are at risk for eye injuries. Causes other than balls accounted for one third of the injuries and included fingers in the eye at football, squash rackets and an épée.

DISCUSSION

Comparison of Injuries at Different Types of Football

Seventy-five per cent of all sports injuries occurred at one or other of the three types of football played at Eton. The rules of Rugby and Association football are familiar but few people have seen Eton football played. Before a comparison of the injuries sustained at the different types of football is made it is necessary to explain this game. Two umpires control the game which is played between two sides of eleven players using a

round football which is slightly smaller than that used in Association football. Eight of the players each side form a bully which is similar to a scrum at Rugby football except that the front row of one side keep their heads up. The remaining three players on each side play behind the bully. No passing of the ball is allowed so the boy in possession of it dribbles until tackled. The ball can only be touched by the hand in the scoring of a rouge which is achieved in the same way that a try is scored at Rugby football. Conversion is then attempted as follows. The ball is placed one yard from the goal mouth. (The goals are similar to but smaller than those used in Association football). In the goal mouth the defending bully forms up, the front row with heads up. Three yards away three boys of the opposing side line up one behind the other tightly bound forming a ram. The ram with heads down charges the bully and hopes to get the ball through the goal. Heading the ball is allowed but occurs infrequently.

In order to make a valid comparison of injuries at these three types of football it was necessary to know how many boys were at risk playing each type. Ideally one should also know how long they played for to obtain the figure for player hours but this was not known. 10 per cent of boys do not play any football. 90 per cent play Eton football in the Lent term; 75 per cent play Association football and 15 per cent play Rugby football in the Michaelmas term. The solid blocks in Figure 3 show the actual number of injuries which occurred at the three types of football. The empty blocks convert the height of the columns to a valid comparison. The result shows that Rugby football causes many more injuries than the other two games and that Eton football is the safest game with regard to all types of injury. The high incidence of concussion at Rugby football is due to the Rugby tackle and mauls and ricks. The higher incidence of concussion at Association compared to Eton football is due to collisions at heading. In the breakdown of fractures (Table V) it is seen that over half the fractures occurring at Eton football affect the leg compared to a much smaller similar percentage at Association and Rugby football. This reflects the greater amount of hard tackling that takes place at Eton football due to the rule forbidding passing of the ball. At Association football over half of the fractures occur in the arm due to the frequency of falls at this game and a similar percentage at Rugby football due no doubt to the Rugby tackle. The percentage of head and neck fractures (all nasal except one) were similar in each type of football accounting for about a third of the fractures.

Fig. 3: Comparison of injuries at three types of football.

Table V Fractures at the three types of football.

Site	Eton		Football Association		Rugby	
	No.	%	No.	%	No.	%
Leg	9	56	3	13	2	11
Arm	1	6	14	61	10	56
Head and neck	6	38	6	26	6	33
	16	100	23	100	18	100

Total 57 fractures

Management of Injuries

The management of boys with minor head injury consisted of close observation and rest in bed until recovery. A skull X-ray was only taken if clinical grounds seemed to warrant it or if the cause of the head injury was a high velocity small ball (e.g. rackets ball). Boys admitted the same day as the injury recovered more quickly than those whose admission was delayed. The management of soft tissue injuries consisted of the classic triad of ice, compression and elevation where appropriate, followed by physiotherapy. Knee injuries require careful observation and repeated examination as definite diagnosis may not be possible initially due to the swelling. Boys with trunk injuries may require admission for observation to make sure there is no underlying damage to the spleen, liver or kidneys. Strict control of activity is needed in cases of quadriceps haematoma to prevent the development of myositis ossificans. Sixty out of the 71 fractures and six of the seven dislocations required consultant care which was given either at the Sanatorium or in a local hospital initially. Boys with eye injuries were examined at least once a day and referred to an eye specialist if progress was not satisfactory.

Prevention of Injury

Prevention of injury should be the concern of everyone involved in sports activities. The school doctor has a special responsibility in this field. After all he diagnoses and treats the injuries which occur and he may see ways of preventing similar injuries in the future. He should take a careful history of the circumstances of the injury. This may reveal a

dangerous situation in a game which demands a change of rules. Following the occurrence of a fractured neck at the ram in Eton football the distance the ram charged was reduced drastically to the present three yards to reduce the force of impact. Two new rules were introduced by the Rugby Football Union in 1983 for under 19 Rugby football largely in response to doctors' anxiety at the increasing incidence of cervical spine fractures in school games. The circumstances of the injury may indicate the necessity of tightening up an existing safety measure, such as the regular inspection of football boots to reduce the number of injuries caused by football studs, particularly nylon studs suffering from uneven wear. Sometimes a new safety measure is required. The continuing toll of serious eye injuries at squash could be prevented by the player wearing wrap-around frames with polycarbonate lenses or padded visors.

The history of the injury may also reveal that the boy is indulging in a sport in which he requires coaching or to which he is not physically suited. Repeated back strain after, for example, bowling at cricket may indicate a poor technique and a session with the coach will do more good than one with the physiotherapist. Repeated backache after rowing may reveal that the boy is attempting a sport which his physique will not sustain and he should be guided to an alternative sport. The school doctor is in a unique position to emphasise the importance of training for fitness in a sport but to caution boys against inappropriate weight training during the phase of rapid adolescent growth. Some boys' excessive enthusiasm needs to be curbed. After he had performed a hundred and three squats on the trot one boy was unable to climb stairs for four days. The school doctor must decide when a boy has recovered from injury and is fit to resume a particular sport. He should never bend to pressure by a coach or housemaster for the boys' premature appearance on the games field.

References

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BOOK REVIEW

Title: CARDIAC REHABILITATION: EXERCISE TESTING AND PRESCRIPTION
Editors: K. P. Hall, G. C. Meyer and H. K. Hellerstein
Publisher: MTP Press, Lancaster, England
 Price: £37.50 Hard Cover

This 450 page volume is the first in a series on "Sports Medicine and Health Science".

I must admit to finding it very disappointing. It is a multi-author hotchpotch with 26 chapters and virtually useless for the novice wanting any sort of introduction to the subject. It may be of value to someone already working in the field as the chapters are well supplied with references, but the book itself is very poor as a reference volume despite its length. From the title one would assume that one could look up a Bruce Protocol, oxygen pulse, anaerobic threshold, and have a reasonable chance of finding these displayed or discussed, but no! What is the point of a chapter on nuclear cardiology without a single illustration? How can diagnosis of coronary disease be discussed in a book with this title without a discussion of the sensitivity and specificity of exercise testing and the relevance of Bayes Theorem. The chapter on "non invasive prediction of heart disease" is two and a half pages of text.

This book appears to have set out NOT to compete with others on the market. It is mainly on Cardiac Rehabilitation and the title is misleading. It has many silly errors (*atrio*-ventricular oxygen difference, instead of *arterio*, myoglobin has only one *ion* atom available instead of iron).

The authors are nearly all from The Gundersen Clinic Ltd., La Crosse, Wisconsin, and it appears to be directed at Cardiac Rehabilitation Staff rather than either cardiologists, physicians or physical educationalists all of whom would I think find this book disappointing. If the title had solely been "Cardiac rehabilitation: exercise prescription", it would be less open to criticism.

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