A Twelve Month Study of Sports Injuries in One Irish School

M. A. Weir, A. W. S. Watson

Sports Injuries Research Centre, University of Limerick

Abstract

A literature review suggested that both acute and overuse injuries were common in body contact sports. This hypothesis was tested on a group of 266 Irish adolescents in an investigation that examined the incidence of injury amongst these individuals over a twelve month period. The mean age of the subjects was:- males 14.3 ± 0.85 years and females 14.1 ± 0.90 years. The responses of the subjects to a questionnaire on their sporting involvement, training and sports injuries were analysed. A total of 230 injuries were incurred by the subjects during the twelve month period: 181 of these were to males. However, the number of injuries per hour of participation was similar in the two sexes. Subjects involved in body contact sports incurred the highest number of overuse injuries. The injury rate per 10,000 hours of participation was highest in badminton (70.85 injuries per 10,000 hours), gymnastics (68.18), rugby (59.77) and basketball (56.22). The rate of overuse injuries was high in swimming, badminton and athletics. The most common injuries were ankle sprain and overuse injuries of the knee and thigh. Recurrence of old injuries was found to be common. The results of the study suggests that injury prevention programmes should be targeted to a wider range of sports, to females as well as to males, and that rehabilitation programmes need to be improved.

Introduction

Most previous investigations into the incidence of sports injuries in Ireland have come from hospital accident and emergency departments (Breathnach[1], Condon and O'Donoghue[2], Cuddihy and Hurley[3], Flood and Mina[4], O'Sullivan and Curtin[5], Stokes et. al.[6]). There does not appear to have been any empirical research carried out into the incidence of overuse injuries in adolescents in this country. The present investigation was designed to collect such information on a one-year retrospective basis, and to compare the results with studies carried out in other parts of the world.

Subjects and Methods

The study was carried out over a twelve-month period in one Irish second-level school. The purpose of the investigation was explained to the subjects and their informed consent was obtained prior to the start of the investigation. The subjects were 149 males (mean age 14.3 ± 0.85 years) and 117 females (mean age 14.1 ± 0.90 years). This sample represented all the pupils aged between 12 and 15 years of age who were taught Physical Education by one of the two Physical Education teachers in the school. These pupils were asked to complete a questionnaire giving details of their sporting involvement, training, and any injuries sustained during the preceding 12 months. For the purposes of the study a sports injury was defined as any pain, discomfort or incapacity which the subject experienced during the preceding 12 months which he or she could attribute to participation in sport, and which necessitated curtailment or absence from training or competition for at least two days. An overuse sports-injury was defined as any pain, discomfort or incapacity which could reasonably be attributed to participation in sport and which did not result from a single incident or direct blow. Subjects were encouraged to respond in as much detail as possible to the questionnaire, particularly with reference to when and how any pain or discomfort manifested itself, and how the injury occurred. The identification of overuse injuries was made by analysis of the comments of the respondents in relation to the mechanism and onset of the injury. The subjects were asked to identify the precise location of each injury on a drawing of the human body, viewed from both the anterior and posterior aspects. They were also asked whether the injury was a recurrence of an old injury. All the questionnaires were completed under the supervision of the first author who was able to assist each subject in obtaining accurate classification of their injuries. The responses to the questionnaire were then analysed using the SPSS 6.0 Statistical Analysis package and the Microsoft Excel 5.0 Spreadsheet. In order to investigate the reliability of the responses to the questionnaire a randomly selected sample of 50 of the subjects was re-tested one week later. The range of exact responses between the original questionnaire and the retest varied between 56% and 94% and the overall average reliability of the responses was 76%.

Results

The total number of injuries incurred by the subjects was 230. Table I gives a breakdown by sex and age. The males incurred over three times as many injuries as the females. The group that reported the largest number of injuries was the group of 14 year-old males, but the incidence of injury (per person per year) was highest in the 12 year-old males. Males accounted for 78.69% of all the injuries. Of the 24 overuse injuries to the knee 23 were reported by males. Nineteen of the acute injuries to the knee were sustained by males subjects. All six

TABLE I
Injuries broken down by Gender and Age

Males (Age)	Number of Injuries	Mean Number of Injuries per Subject
12	17	1.55
13	57	1.21
14	80	1.31
15+	27	0.93
Total	181	
Females (Age)	**Number of Injuries**	**Mean Number of Injuries Per Subject**
12	5	0.33
13	14	0.36
14	22	0.51
15+	8	0.4
Total	49	

of the acute injuries to the groin were incurred by males.

Figure 1 breaks down the injuries according to sport. The activity in which the largest number of injuries occurred was soccer with 44 injuries. The next highest number were in the "hurling and camogie" and the "other sports" groups, both of which recorded 33 injuries. The "other sports" category included a variety of sports (golf, pitch-and-putt, judo and karate, skateboarding, cycling and kart racing) that, individually, had only a small numbers of participants.

Figure 2 gives details of the overuse injuries incurred by the subjects. Males suffered four times as many overuse injuries as females - 64 as against 16. This imbalance was particularly striking with regard to overuse injuries of the knee and thigh.

Table 2 shows the number of acute and overuse injuries reported per 10,000 hours participation at different sports. Badminton resulted in a similar incidence of acute and overuse injuries. In contrast, subjects involved in body contact sports such as soccer, rugby and basketball were over twice as likely to suffer an acute injury as an overuse

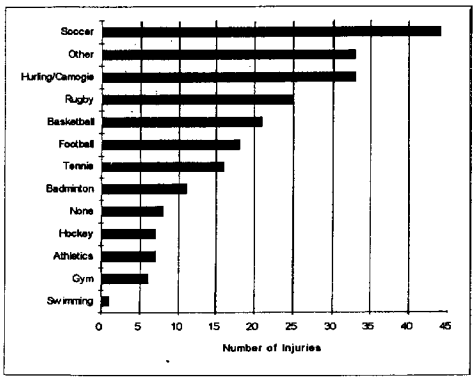

Figure 1.– Number of injuries reported in various sports over a 12 month period by 266 school children.

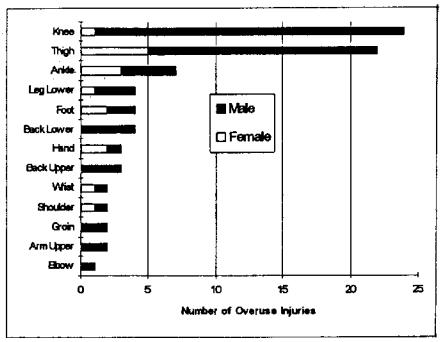

Figure 2 – Number of overuse injuries sustained over a 12 month period by 266 school children. Injuries broken down by gender and anatomical location.

injury. Gymnastics also involved a high risk of acute injury.

Figure 3 gives details of the number of overuse injuries which were re-injuries i.e. a previous injury which had recurred. All of the subjects who suffered overuse injuries of the ankle reported that these were old injuries which had recurred. In contrast, the majority of overuse injuries of the thigh were new injuries.

Table 3 details the effects of both acute and overuse injuries on the athlete's sporting involvement. Acute injuries were generally the more serious problem to the athlete, both in terms of their incidence and the amount of time taken for their recovery.

Discussion

Age of the Injured Subjects

The finding of a higher incidence of injury in males than in females is in agreement with the results of most other studies (De Haven[7], Zaricznyj et. al.[8], Watson[9]). In

TABLE II
Number of Acute and Overuse Injuries per 10,000 Hours Participation at specific Sports.

	Acute	Overuse
Athletics	13.40	33.49
Badminton	32.21	38.65
Basketball	40.16	16.06
Football	24.84	19.88
Gymnastics	45.45	22.73
Hockey	31.27	20.84
Hurling/Camogie	19.45	16.21
Other	14.21	5.33
Rugby	40.65	19.13
Soccer	31.70	11.89
Swimming	0.00	43.86
Tennis	28.79	6.64

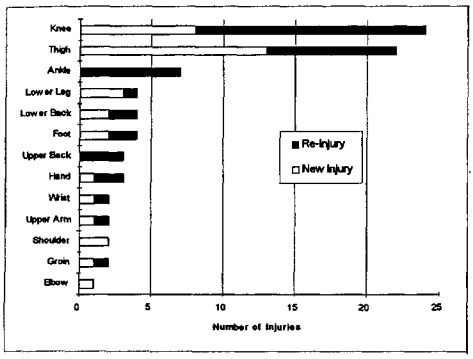

Figure 3 – Number of Injuries sustained over a 12 month period by 266 school children. Injuries broken down by anatomical location and whether the injuries were new or a recurrence of an old injury.

the female subjects of the present study the incidence of injury increased with age. However, in the males the incidence was highest in the 12 year-old group. This result is at variance with those of several other studies that have found that the incidence of injury rises with age in adolescents (Sullivan et. al.[10], Zaricznyj et. al.[8], Kujala et. al.[11], Backx et. al.[12], Watson[9]). The reason for this difference is not known.

Type of injury

The most common single injury was ankle sprain which accounted for almost 18% of the total injuries. This finding is in agreement with various studies carried out in other countries, covering a wide variety of sports (Nielsen and Yde[13], Backx et. al.[12], Sullivan et. al.[10], Lysens et. al.[14], Garrick and Requa[15]). The knee was the anatomical site that incurred the highest number of injuries, with 43 injuries or almost 19% of the total. This finding is also in agreement with those of other authors (Garrick and Requa[15], Andrish[16], Dalton[17], De Haven[7], Backx et. al.[12]). Injuries to the thigh were also relatively common in the present investigation. Injuries to the lower extremity were very common and accounted for 149 (65%) of the total injuries. This result is in agreement with the findings of other authors who studied a wide variety of different sports and age groups (Watson[18], Garrick and Requa[15], Nielsen and Yde[13], Backx et. al.[12], Jorgensen and Winge[19], De Haven[7]). Thus the subjects of the present investigation appear to be typical as regards to the anatomical distribution of their injuries.

TABLE III
Effect on Athlete's Participation of Acute and Overuse Injuries

	Acute	Overuse
Total Number of Injuries	150	80
Number of Injuries Per Subject Per Year	0.56	0.30
Number of Injuries Per 10,000 Hrs Training	25.60	13.65
Days of Injury Per 10,000 Hours Training	341.61	182.19
Average Number of Days In Hospital Per Injury	0.47	0.38
Average Number of Days Off Sport Per Injury	13.69	11.78
Average Number of Days Reduced Performance Per Injury	11.56	6.48
Average Number of Days to Full Recovery Per Injury	21.10	17.23

Injuries in different Sports

The sports which accounted for the largest number of injuries were the contact games soccer, hurling, camogie and rugby. The greatest number of injuries (44 or 19% of the total) was recorded in soccer. Hurling/camogie came next and accounted for 33 injuries or 14% of the total number. Subjects involved in "other" sports also incurred 33 injuries. The high number of injuries amongst the players of body contact sports is in agreement with the findings of Watson[9]. The number of injuries incurred in the various female sports is broadly similar to the findings of Garrick and Requa[15] in an American study.

Number of Injuries per 10,000 hours of Participation

Badminton players had the greatest likelihood of sustaining an injury per hour of exposure (almost 71 injuries per 10,000 hours participation). Although this figure seems high, it may be accounted for by the fact that badminton players had comparatively low rates of participation thus yielding a high rate of injury per 10,000 hours of participation. The rate of injury amongst badminton players in the present investigation represents an injury rate of one injury per subject every 23 weeks. Gymnasts (68) and rugby players (60) also had high rates of injury per 10,000 hours of participation. An exact comparison between these findings and those of investigators in other countries is difficult because of national differences. The findings with regard to badminton do not concur with those of Backx et. al.[12] who found that badminton had a low injury rate amongst Dutch school children. This difference may, perhaps, be accounted for by the fact that the present subjects played badminton competitively while Backx's subjects were beginners. The results of the present investigation regarding gymnastics, rugby and basketball are largely in agreement with those of Chambers[20] who found that American football (a sport somewhat similar to rugby), basketball and gymnastics were the activities with the highest risk of injury in children aged 6 to 17 years. A relatively high incidence of injury per ten thousand hours participation has also been found amongst American football players, basketball players and gymnasts (Zaricznyj et. al.[8]), although the definition of injury used in this latter investigation is likely to have precluded the inclusion of any overuse injuries.

Injuries and Gender

79% of the injuries recorded in the study were to males and only 21% were to females. This finding is similar to that of several other authors (De Haven[7], Zaricznyj et. al.[8], Watson[9], Backx et. al.[12]. However, in the present study the number of injuries per hour of participation is very similar in the two sexes. The total number of hours training per week at peak season was 1568 hours for males and 420 hours for females. The number of injuries per hour of training per week at peak season was therefore 0.115 for male subjects and 0.117 for females. Thus the higher number of injuries amongst males is more a reflection of the levels of involvement than an indication that males are more injury prone than females. This finding is in agreement with those of Garrick and Requa[21] who found that, with the exception of volleyball, injury rates were similar for the two sexes when they were both involved in the same sports. However, Sullivan et. al.[10] found that the injury rate amongst female soccer players aged 7 to 18 years was actually double that of males of the same age. In the present investigation, when overuse injuries alone are examined, the rates of injury per hour of training per week at peak season are 0.0408 for the males and 0.0380 for the females. Once again this suggests that the likelihood of either sex sustaining an overuse injury is very similar.

Even when the different levels of participation are taken into account there appears to be an imbalance in the incidence of certain specific types of injury. The most striking example of this is with overuse injuries of the knee: twenty three out of 24 of these injuries were incurred by male subjects. A possible reason for this may be the greater proportion of males involved in sports which require kicking - an action which places the knee under considerable strain. A higher incidence of certain overuse injuries of the knee (e.g. Osgood-Schlatter's disease, Sinding-Larsen-Johannson syndrome) has been noted in males by De Haven[7], Micheli[22], Orava and Virtanen[23], Kujala et. al.[11], Anderson[24]. In the present study a similar imbalance was noted in the sex distribution of acute knee injuries, males accounting for 18 of the 19 examples of this condition. When the levels of participation are taken into account as above i.e. in terms of total hours participation per week at peak season, females incurred almost three times as many overuse injuries of the ankle as males. Females also incurred over three times as many overuse injuries of the foot.

Overuse Injuries

The most common overuse injuries were those of the knee (24 examples), which accounted for 10% of the total injuries and 30% of all overuse injuries, followed by overuse injuries of the thigh (22), which accounted for 9.6% of all injuries and about 28% of all overuse injuries. Overuse injuries of the lower extremity accounted for 27% of all injuries and 76% of all overuse injuries. These figures highlight the fact that the lower extremity is the area of the body most at risk of overuse injury, with the knee being particularly vulnerable. This finding is in agreement with those of a number of other studies (Schwellnus[25], Andrish[16], Dalton[17], De Haven[7], Micheli and Fehlandt[26]), all of which found that the majority of overuse injuries were to the lower extremity and that the knee was the most common individual site. It was a little surprising to find that there was only one case of overuse injury of the elbow in the present study since there were 31 subjects whose sport was either tennis or badminton. In an investigation into injuries amongst club badminton players in Denmark, 17 out of 169 overuse injuries (10%) were tennis elbow (Jorgensen and Winge[19]). It is likely, however, that this particular overuse injury is more common in athletes who are older than those studied in the present investigation.

Recurrence of Overuse Injuries

Recurrence of certain overuse injuries has been shown to be relatively common (Lysens et. al.[27], Lysens et. al.[14]). In the present investigation all seven overuse injuries of the ankle were recurrences of old injuries. Exactly why this particular overuse injury should demonstrate such a high rate of re-occurrence is difficult to say. Tropp et al.[28] found that ankle joint injury did not result in persistent functional instability, but this result probably depends upon the effectiveness of the treatment and rehabilitation of sports injuries: the investigation needs to be repeated in this country. All three overuse injuries of the upper back were also re-injuries, and overuse injuries of the knee also had a high rate of recurrence. The findings of the present investigation are largely similar to those of Lysens et. al.[14,27]. The high rate of re-injury suggests an underestimation of the severity of the original injury and an inadequate period of rehabilitation. It seems that the natural desire of the young person to resume activity as quickly as possible leads, in fact, to a more substantial time loss later, caused by a recurrence of the original problem.

In terms of the effect that injury has upon the participation of the young athlete, acute injuries present a more serious problem than overuse injuries. In each of the categories considered acute injuries occurred more frequently, and the symptoms persisted for longer, than was the case with overuse injuries.

Conclusions and Recommendations

This is the first detailed study of sports injuries carried out on a cross-section of young people in this country. Previous research has involved an examination of a particular sport or an analysis of Accident and Emergency records. The most important findings of the study are as follows. (1) The larger number of injuries to male adolescents is due to higher participation rates. Per hour of participation females are just as likely to be injured as males. In some circumstances the risk may be even higher in females. Thus the minority of female adolescents who train and compete intensively are at high risk of sports injury and should be particularly targeted in injury

prevention interventions. (2) Male adolescents are at a particular risk of knee injuries. Prevention programmes should target such conditions in males who are involved in kicking games. (3) The risk of injury per hour of participation is high in sports like badminton, gymnastics and basketball. Overuse injury rates in swimming, badminton and athletics were also found to be relatively high. These sports should be the subject of the same kind of injury prevention interventions now current in the field games that have been traditionally regarded as being high risk activities. (4) The most common injuries were found to be acute trauma to the ankle and knee and overuse injuries of the knee and thigh. Previous studies have been carried out on in this country on acute injuries, but the present investigation appears to be the first to highlight the problem of overuse injuries in adolescent sport. Consideration needs to be given to improving methods of prevention of these conditions, many of which are associated with intrinsic factors such as poor flexibility, or deviations of posture and body mechanics. (5) The study demonstrates that re injury of previous sports injuries is a serious problem. This suggests a need for more effective treatment and rehabilitation of sports injuries in adolescents. Those involved in treating young athletes should be made aware of the need to remove or reduce any intrinsic factors that may have contributed to the injury in the first place. They must also attempt to ensure patient compliance with an effective rehabilitation programme.

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