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Survey

Track and field athletics injuries – a one-year survey*

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The training programmes and competitive performances of 147 track and field athletes, from many different clubs within the UK, were analysed retrospectively in order to study the incidence, severity and types of injuries which they had suffered during the year September 1989–September 1990. This information was then related to the particular event in which they specialized as well as a number of hypothetical risk factors proposed for making them more prone to injury. Of the athletes 96 (65.3%) were male and 51 (34.7%) were female, and their ages ranged from 14 to 32 years, with their levels of competition ranging from 'competitive spectators' to UK internationals. A marked correlation was noted between their age, level of competition, number of supervised training sessions which they attended, and their incidence of injuries. However, certain other factors which were studied, such as their sex, the hours they trained, and the particular event in which they specialized appeared to provide *no* obvious relationship.

Keywords: Track, field, athletics, injuries

In today's society, sport is being widely accepted as an integral part of keeping fit and an aid to retaining a healthy lifestyle. Even in the absence of scientific proof, few people doubt the beneficial effects of sport on their fitness and sense of well-being. Not only are their recreational and social lives extended, but they also see strengthening of their muscles, improvement of their flexibility, increases in their stamina and improvement in their weight control. Although there has been a recent increase in the number of sports injury clinics being set up in this country, it does not appear to have totally controlled the rapidly increasing incidence of the negative results of sport, i.e. the sports injuries.

This study was aimed at track and field athletes residing in the UK who performed at 'different levels of competition'. The incidence, severity and types of injury which they had suffered in the previous year was analysed to see if there was any relationship between these results and their age, sex or level of competition, as well as with respect to their training programmes, the training facilities they used, the amount of coaching they received and the main event in which they specialized (see *Table 1*).

Table 1. Event categories

Sprints	100 m
	200 m
	400 m
Middle distance	800 m
	1500 m
Long distance	3000 m
	5000 m
	10 000 m
	Walks (W)
Hurdles	80 mH
	100 mH
	110 mH
	400 mH
	Steeplechase (SC)
Jumps	Long jump (LJ)
	Triple jump (TJ)
	High jump (HJ)
	Pole vault (PV)
Throws	Javelin throw (JT)
	Hammer throw (HT)
	Discus throw (DT)
	Shot putt (SP)
Multi-events	Decathlon
	Heptathlon

Methods

At the onset of the outdoor track and field season in May 1991, questionnaires were given to the manager of the British Junior Athletics Team and the captain of the Birmingham University Athletics Team with the request for them to be issued to the members of their teams respectively. In addition to these teams the author himself distributed other questionnaires directly to members of Leeds University AC, Aston University AC, Surrey University AC and athletes who competed for Warrington AC, Liverpool Harriers and Liverpool Pembroke. Overall 160 questionnaires were distributed, and in order to encourage a high response rate, they were kept as short as possible. A total of 153 questionnaires was returned (i.e. more than 95%), but of these six were discounted from the study (for being incompletely filled in, being completed by athletes who had not competed in the previous season for reasons other than injury, or for being completed by athletes who specialized in obscure events (at the time) for which it was difficult to find recognized UK records (e.g. women's triple jump/hammer throw)).

Within the questionnaire the athletes' 1990 season's best (SB) performance, as well as their personal best (PB) performance were collected and the level of

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competition at which they were involved was calculated by comparing their SB to the UK records for each individual event, according to their age and sex. The SB was used whenever possible, rather than the PB in order to assess the level of competition in which they were involved during 1990, and this allowed, for example, athletes who may have been internationals at some time in their careers to be analysed with respect to their 'present standards'. The only execeptions to this rule during analysis of the results were those athletes who recorded an injury 'at or before the beginning of the competitive season' if it lasted for the 'whole season'. In these athletes the PB was used.

For track events, in which the performance is measured by time the following equation was used:

Level of competition = 1990 UK record/1990 SB

e.g. For a man, aged 23 years, 100-m sprinter whose season's best was 10.50 s

Level of competition = 9.97/10.50, i.e. 95.0%

For field events and multi-events, in which the performance is measured by distance or points respectively, the following equation was used:

Level of competition = 1990 SB/1990 UK record

e.g. For a girl, aged 16 years, javelin thrower whose season's best was 53.20 m

Level of competition = 53.20/56.02, i.e. 95.0%

The meaning of the word injury was left to the subjective interpretation of the athlete. However the response to this question was only considered as a positive response in the analysis if the injury had lasted more than or equal to 1 week.

Once each questionnaire had been evaluated, with respect to the level at which each athlete had competed, the hours which he/she had trained during an average summer/winter week, as well as the information on injuries sustained, the data were categorized into a number of subgroups using a Foxpro database program (Microsoft, Wokingham, UK) and were then analysed using the Statistical Package for Social Sciences (SPSS, Chicago, Illinois, USA) on an IBM personal computer. A number of significant and important nonsignificant results were observed.

Results

Of the 147 questionnaires which were completed 'adequately' the mean(s.d.) age was 18.0(2.5) years (range 14–32 years) and they were categorized into the following groups: less than 17 years – youth (Y)/intermediate (I); older than 17 years but less than 20 years – junior man (JM)/junior woman (JW); older than 20 years – senior man (SM)/senior woman (SW). Athletes within the study who were less than 15 years of age, had their 'levels of competition' calculated using the UK records for their respective age groups (i.e. boys/girls). However in the injury analysis of these athletes they formed a group of fewer than five subjects, and so have been included in the age category youth/intermediate respectively.

Of the athletes, 96 (65.3%) involved in the study were male and 51 (34.7%) were female, and the events in which they specialized are illustrated in *Figure 1*, however 66.7% of them reported that they had other sporting interests, ranging from rugby and football to swimming and snooker.

The levels of competition at which these athletes competed were calculated and were found to range from 42.5% to 100% and they were categorized into the subgroups shown in *Figure 2*.

Of the 147 athletes who took part in the study, 90 (61.2%) suffered an injury of some kind during the season and the information provided by these 90 athletes was further analysed to delineate the various hypothetical risk factors which put them more at risk of becoming injured than the noninjured competitors.

Age

Of the 147 athletes analysed in the study, their age/injury incidence is shown in *Figure 3* and these results showed a significant increase (χ^2 test; P = 0.002) in the number of injuries in the older athletes (96.2%) compared with the younger athletes (51.3%).

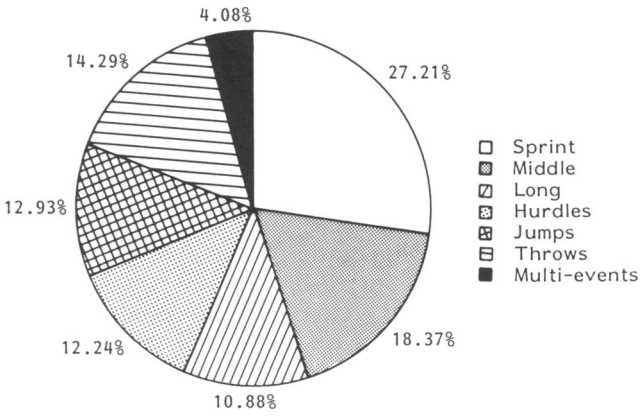

Figure 1. Main events of the athletes studied

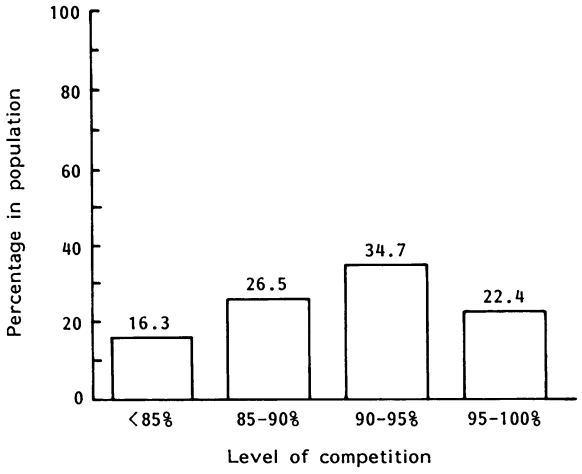

Figure 2. Level of competition of sample population

Coach

Of those in the sample population, 15.0% had no coach at any of their training sessions, 49.7% had a coach at some of their training sessions and only 35.4% had the coach present all the time they trained. The presence of a coach appeared to have a significant effect (χ^2 test; $P = 0.0004$) on their 'avoidance' of injuries such that of those who had a coach present all the time only 40.4% suffered an injury while 81.8% of those who trained and competed alone were injured at least once during the season (see *Figure 4*).

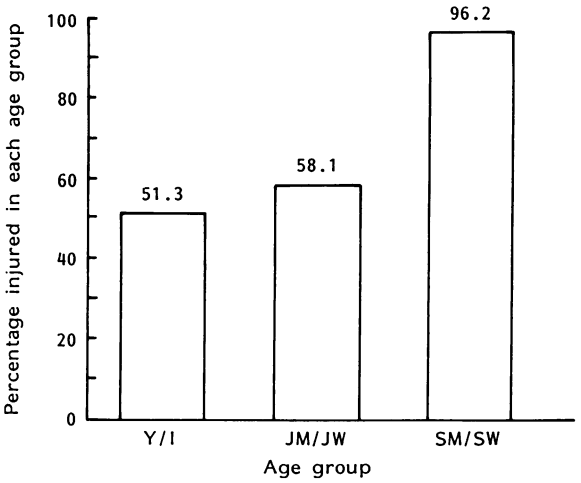

Figure 3. Age analysis of those injured

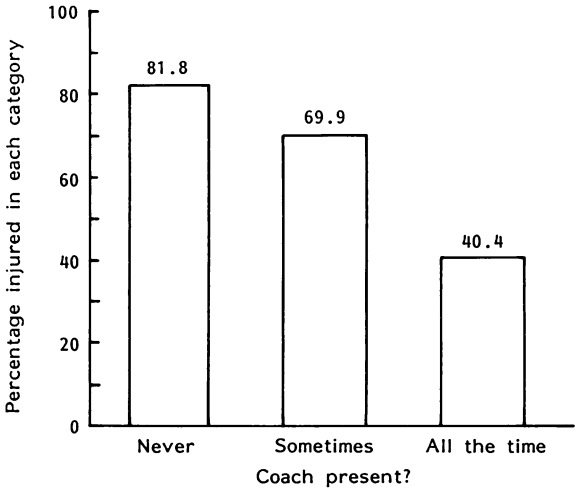

Figure 4. Coached training and injury incidence

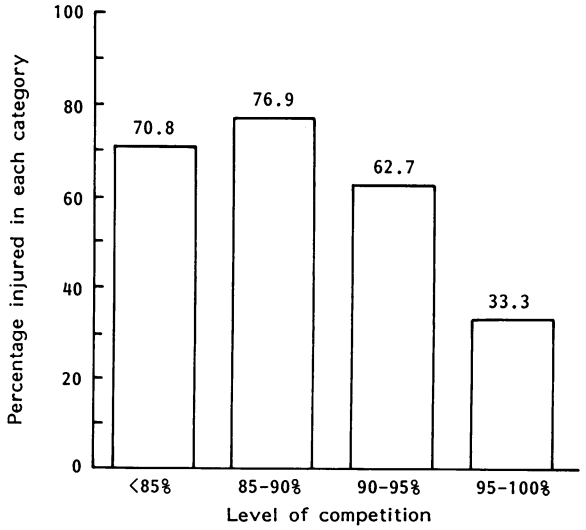

Figure 5. Level of competition and injury incidence

Level of competition

When the incidence of injuries was related to the levels of competition at which the athletes were involved the results obtained were plotted as shown in *Figure 5*. These results were again highly significant (χ^2 test; $P = 0.012$) such that over 70% of those who were competing in the lowest category were injured whereas only 33.3% of those involved at the highest levels suffered any injury.

Sex

Of the 96 males involved in the study, 61 suffered an injury (63.5%) and in the 51 female athletes, 29 were injured (56.9%). This result was not significant and so the hypothesis suggesting an increased incidence in the number of female injuries was rejected.

Hours trained

The hours trained during the average week are shown in *Table 2* and when the hours trained by the injured athletes were compared with those trained by the noninjured athletes it was thought that a positive result indicating the commonly accepted aetiological proposal with regard to the incidence of overuse injuries, would be shown. *Table 3* however shows the

Table 2. Hours trained during the average week

Training category	*% of total who trained this long during the winter*	*% of total who trained this long during the summer*	*% of total who trained this long during an average week*
<5 h week^{-1}	12.3	21.8	13.6
5–10 h week^{-1}	53.7	56.4	53.7
>10 h week^{-1}	34.0	21.8	32.7

Table 3. Injury incidence relative to hours trained

Training category	*% who trained for this amount of time during the winter, and by the end of the year became injured*	*% who trained for this amount of time during the summer, and by the end of the year became injured*	*% who trained for this amount of time during an average week, and by the end of the year became injured*
<5 h week^{-1}	61.1	59.4	60.0
5–10 h week^{-1}	62.0	61.4	60.8
>10 h week^{-1}	60.0	62.5	62.5

Table 4. Injury incidence by event

Event	*No. from population*	*No. injured*	*% injured in each event*
Sprints	40	27	67.5
Hurdles	18	12	66.7
Long distance	16	10	62.5
Throws	21	13	61.9
Middle distance	27	15	55.6
Jumps	19	10	52.6
Multi-events	6	3	50.0*

*The lowest incidence of injuries as seen in the multi-eventers in this table must be analysed with careful attention to the fact that this group only contained six athletes

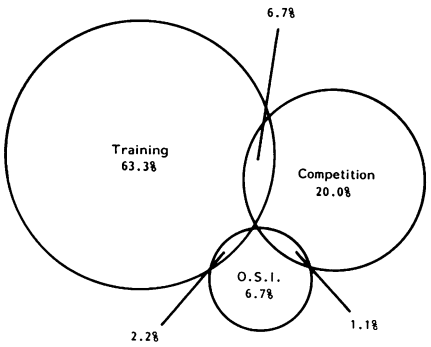

Figure 6. Time at which injury was suffered

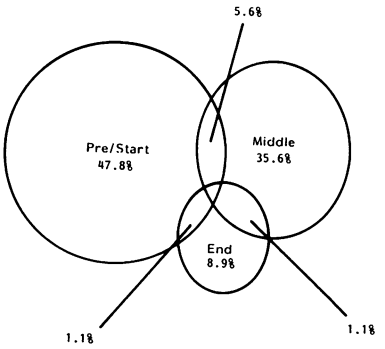

Figure 7. Injury occurrence, related to part of year

relationship between the incidence of injuries and the hours spent in training and no significant relationship between them was found.

Events

The percentage of athletes injured within each event category was analysed and is shown in *Table 4* and when questions enquiring as to the different parts of the body most commonly affected, were analysed, the results gave the distribution shown in *Table 5*. The occurrence of these separate injuries was further analysed in relation to their incidence in each individual event and the results determined were entered into *Table 5* with the most commonly affected region for each separate event highlighted in bold type.

Injured when?

A great proportion of the injuries occurred during training (greater than 60%), while only about 20% were seen during a competition and 10% occurred during 'other sporting interests' (OSI). Although the time at which the worst injury occurred was requested in the questionnaire, multiple answers were given by those athletes who suffered more than one injury and so the results have been shown in the form of a venn diagram (see *Figure 6*). Most of the injuries occurred at the beginning of the season, with the least occurring towards the end (see *Figure 7*).

Discussion

In an article written by J. G. P. Williams in 1971[1], the aetiology of sports injuries was arranged into a number of different groups. The primary consequential injuries (i.e. those which occurred directly as a result of the sporting activity) were classified into two basic groups:

1. *Intrinsic/self-inflicted injuries* – these included incidental injuries such as a pulled hamstring in a sprinter, and also overuse injuries, e.g. chronic Achilles' peritendinitis in middle distance runners.
2. *Extrinsic injuries* – these occur in 'contact sports', such as rugby and football, and they also occur in accidents involving apparatus, e.g. hockey sticks, cricket balls.

Table 5. Analysis of different regions injured by event of injured athlete

Event	*Of those injured in each separate event, the % injured in each particular anatomical region*									
	Shin	*Back*	*Ankle*	*Knee*	*Hamstring*	*Foot*	*Thigh*	*Hip*	*Shoulder*	*Elbow*
Sprints (NI = 27)	18.5	**29.6**	0.0	7.4	18.5	22.2	18.5	11.1	0.0	0.0
Middle (NI = 15)	**46.7**	6.7	20.0	20.0	13.3	6.7	0.0	6.7	6.7	0.0
Long (NI = 10)	**30.0**	20.0	10.0	10.0	10.0	10.0	0.0	20.0	0.0	0.0
Hurdles (NI = 12)	**25.0**	8.3	16.7	16.7	8.3	8.3	8.3	16.7	8.3	0.0
Jumps (NI = 10)	0.0	0.0	30.0	30.0	20.0	10.0	**40.0**	0.0	0.0	0.0
Throws (NI = 13)	15.4	30.8	**46.2**	7.7	7.7	7.7	0.0	0.0	7.7	15.4

NI, number injured. The results from the multi-events group were not worth analysing because of the low sample size of this group, and so they have been excluded from this table. Also, it should be noted that the percentages within this table do not add up to 100 because if the athletes injured more than one part of the body during their injury then they entered more than one on their questionnaire

'Trackside' injuries are mainly due to intrinsic causes (apart from spectator injuries!), and in a further review by Williams[2], athletics was listed as one of the most common causes of sports injuries (11%), second only to the 'body contact sports' such as Rugby (20%) and Association Football (23%).

In 1987 a report was published in America analysing the athletics seasons of 257 track and field high school athletes prospectively[3]. This article was an in-depth report into the most common types of injury, the management of these injuries and a review of the relationship between their incidence and hypothetical aetiological risk factors.

The article reported just 41 injuries occurring in the 257 athletes who were studied (16%), with nearly half occurring in the sprinters and the most common type suffered was described as 'posterior tibial syndrome', followed by ankle injuries and 'patellar tendinitis' (i.e. knee injury). Furthermore the article suggested that there was no correlation between the 'exposure time' (i.e. time an athlete trained on a weekly basis) and the injury incidence, however a positive relationship was found between the 'performance ability' of each injured athlete and the injury incidence, such that the higher the level of performance at which these athletes competed, the more likely they were to be injured. From the results of this study the authors concluded that: '. . . the more an athlete pushes toward excellence in a competitive event, the greater the chance of injury'[3].

Of the athletes in the present study 61.2% were categorized as being injured – although this was a subjective term left to the discretion of the athletes and probably did not avoid the feature of hypochondria (present in most athletes!), compared with the objective physical examination which was carried out in the American study[3]. Furthermore their study only covered 77 days compared with this study which spanned the whole athletic year of training and competition.

The elasticity of ligaments and tendons is known to decline from about the age of 30 and muscular strength and bone strength both decrease in the 40- to 50-year-old group. Of those athletes in the oldest age group in this study 96.2%, compared with just 51.3% of the youths and intermediates, suffered an injury, and this supports the theory that 'young people' are generally more flexible and their tissues are more resilient.

The benefits of having a coach present at the training sessions were highlighted in this study. Only 40.4% of those athletes who had a coach present at all of their training sessions suffered an injury, compared with 81.8% of those who had no coach at all, even just to plan their training. When athletes tire in a training session (the commonest time for an injury to occur), concentration is diminished, and this may impair accurate assessment of the workload which they decide to subject themselves to. These workloads should be formulated before the session, or with a coach watching their progress, and not 'pushing' them too far. In the skilful events such as pole-vault, hurdles and throws, a coach is essential for adjusting the athlete's technique, so that not only are their performances improved, but also their risks of becoming injured are diminished.

In this study, those athletes in the 85–90% competitive level group had the highest incidence of injuries whereas those in the top group (i.e. 95–100%) had the lowest incidence with just one-third of them suffering an injury. This contradicts the results found by Watson and DiMartino[3] and appears to suggest that the higher the levels of competition in which athletes are involved, the more experienced they are and the less likely to 'push themselves too far'. Most of the 'high quality' athletes had a full time coach, and this may be responsible for injury prevention.

This study shows no significant difference between hours trained in an average week and injury incidence. This appears to support the exclusion of 'overuse injuries' as forming a major contribution to track and field injuries[3] and further enforces the hypothesis that practice of poor technique and unsupervised training are more important factors.

The 'explosive events' (i.e. sprints and hurdles) were the most common in which injuries occurred with 67.2% of those taking part becoming injured. In the 'endurance events' (i.e. middle and long distance), 58.1% suffered injuries and these were led by shin injuries in both middle- (46.7%) and long-distance runners and walkers (30.0%). Ignoring the 'multi-eventers', due to the small sample size of this group relative to the population, the 'field events' (i.e. jumps and throws) had the lowest injury incidence (57.5%). Overall the shin (17.8%) was the most common site affected and this was followed by the back (14.4%), ankles (13.6%) and knees (11.0%). Other studies[2] have listed the knee (23.5%) as the most common site of all sports injuries in general and this was followed by the back (16.5%) and the ankle (14.0%). In some 'track and field' studies the knee is again agreed as being the most common site[4,5], but in the Watson and DiMartino study[3] the shin is accepted as the most common site of injury, followed by the ankle and then the knee.

Although most of the injuries occurred during training, at or before the beginning of the season, it should be noted that 20% occurred during competition and this is relatively high when considering the duration of a competition compared with the time an athlete spends in training, and the stressful aspects of competition may account for this observation. Similarly most of the injuries occurred at the beginning of the season when all of the athletes were still in the study – the number of participants decreased as the season progressed and as more and more athletes became injured. Alternatively this seasonal variation may be caused by the competitive spirit being highest at the start of the season and so more injuries occur then due to the increased pressure to 'win the competition'.

Sperryn and Williams[6] highlighted in the 1970s that the facilities within the UK used to manage sports injuries were inadequate and encouraged the organization of specialist sports clinics to be set up. Although recent increases in the number of sports clinics have aided the management of such injuries,

they have not decreased their incidence and more time should be spent offering advice to the general public as to how each sport should be approached. Although it is difficult to find coaches available most of the time, general sporting days should be organized for school children, and county coaches should be asked to coach these sessions so that the correct techniques are learnt at an early age and future injuries which may have occurred can be avoided – 'prevention is better than cure'.

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