

An epidemiological survey on ankle sprain

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Ankle sprain is a common sports injury and is often regarded as trivial by athletes and coaches. This epidemiological study was conducted among three categories of Hong Kong Chinese athletes: national teams, competitive athletes and recreational athletes. This study shows that as much as 73% of all athletes had recurrent ankle sprain and 59% of these athletes had significant disability and residual symptoms which led to impairment of their athletic performance. This study indicates that a proper approach towards injury prevention and a comprehensive rehabilitation programme are required.

Keywords: Ankle sprain, residual disability, prevention, rehabilitation

Ankle sprain occurs frequently in the sports population. It is caused by the stretching of fibres or of the collagen of the ankle ligaments, whereby the fibres are partially or completely disrupted¹⁻³. Since most sports activities involve running, jumping and turning, high stresses are often put on the joints of the lower limbs, including the ankle. Hansen *et al*⁴ reported that 67.3% of their football players had sprained their ankles during sports. Smith and Reischl⁵, reported that 70% of their basketball players had a history of ankle sprain and 80% of them had multiple sprains. Chronic ankle problems such as chronic pain, muscular weaknesses and ease of giving way were not uncommon for those athletes with a history of ankle sprain³⁻⁷.

Various studies on sports injuries have revealed the high occurrence and high recurrence rate of ankle sprain⁷⁻¹⁰; however, studies on the consequences of ankle injuries and their effects on the level of athletic performance are rare. This study aims to identify the prevalence of recurrent ankle sprain and its related residual symptoms among Hong Kong sportsmen.

Method

Questionnaires were sent to athletes having a history of ankle sprain. The questionnaire consisted of three parts: (1) demographic data such as age, sex, and the dominant leg; (2) sports related data; (3) ankle sprain and its related effects.

Only athletes involved in sports activities on a regular basis were chosen for study. They might be competitive athletes, athletes training regularly, or recreational athletes. All must have sprained their ankle(s) at least once, with detectable swelling and pain around the injured ankle(s). Since this study focused on chronic residual ankle problems, athletes with acute ankle sprain within a 3-month period were excluded from this survey. The questionnaires were distributed to athletes on site – in the sportsfield or on court – and were collected immediately after being filled in, with the result that the return rate was 100%. In total, 400 questionnaires were distributed and collected of which 20 were incomplete, leaving 380 completed questionnaires for data analysis. The χ^2 test was used to test the statistical significance among groups of different attributes.

Results

Athletes' demographic data

Data from 380 athletes were available for analysis. Of these 380 athletes, 271 were males and 109 were females. Their mean age was 24.57 (range 13–47) years. A total of 19 different priority sports activities was recorded (*Figure 1*). The athletes were categorized into four main groups:

1. Hong Kong National Team athletes – elite athletes who had represented Hong Kong in various international competitive events;
2. Competitive athletes – athletes who belonged to various school teams, sports teams or clubs, and who participated in sports at a competitive level;
3. Recreational athletes – athletes who were not members of any sports association but participated in sports for recreational purposes;
4. Others – individuals who, for some reason, took part in regular sports activities or training, e.g. policemen.

Of the 380 athletes, 64 belonged to the Hong Kong National Teams, 177 were competitive athletes of various sports teams/clubs, 125 were recreational athletes and 14 belonged to the 'others' group (*Figure 2*).

The frequencies of sports participation in these groups of athletes are presented in *Figure 3*. Of the total 380 athletes, 157 (41.3%) of them participated in sports four or more times per week. Only 26 (6.8%) of

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them participated in sports less often than once a week. Taking the individual groups of athletes, more than 70% of the Hong Kong National Teams athletes and 45.8% of the competitive athletes participated in sports four or more times per week, while only 17.6% of the recreational athletes were involved in sports activities this frequently. Statistically, the national athletes participated in sports significantly more frequently than the competitive athletes or the recreational athletes; and the competitive athletes participated in sports activities more frequently than the recreational athletes ($P < 0.05$).

Athletes' injury data

Of the 380 athletes with previous ankle sprain(s), 183 (48.2%) of them reported having bilateral ankle sprain, while 197 (51.8%) athletes reported unilateral ankle sprain. For the 197 athletes with unilateral ankle sprain, 139 (36.6%) athletes reported that the ankle of their dominant leg was injured, and 58 (15.3%) reported that the ankle of their non-dominant leg was injured. Thus, a total of 563 sprained ankles was recorded (Figure 4) with injury solely to the dominant leg's ankle 2.40 times higher than injury solely to the non-dominant side.

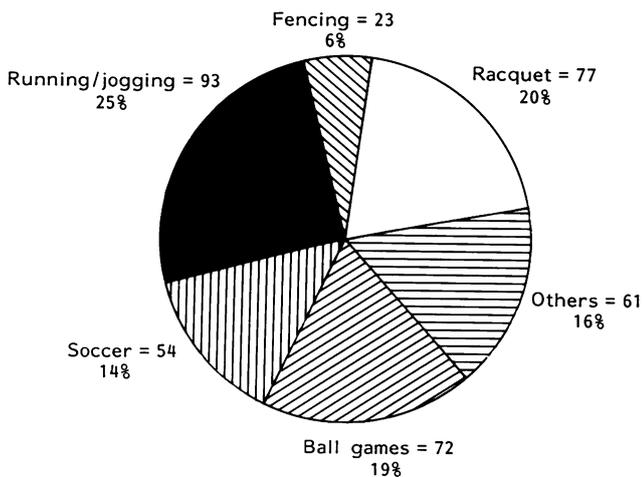


Figure 1. Sports activities pursued by athletes

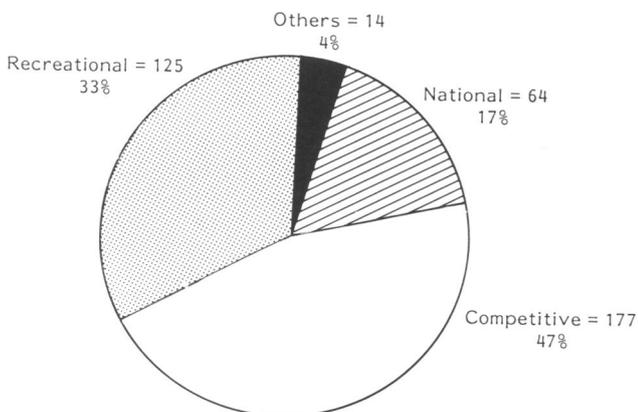
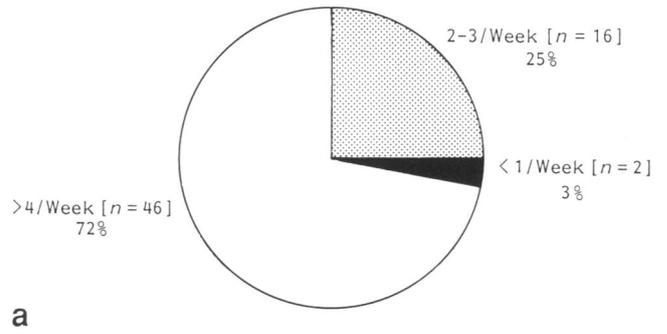
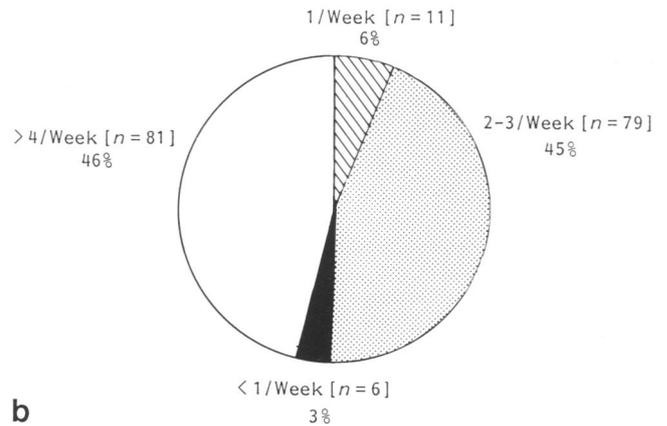


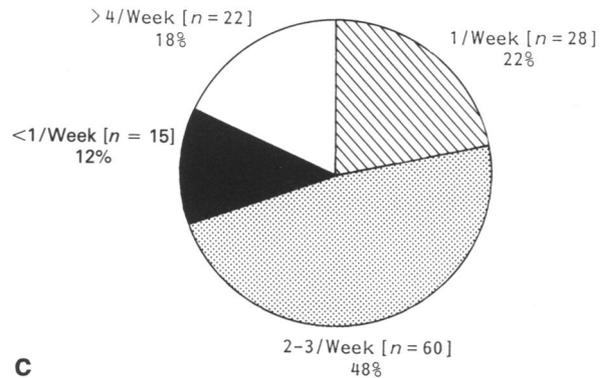
Figure 2. Categories of athletes ($n = 380$)



a



b



c

Figure 3. Frequencies of athletes' participation in sports activities per week; a Hong Kong National Teams, $n = 64$; b competitive athletes, $n = 177$; c recreational athletes, $n = 125$

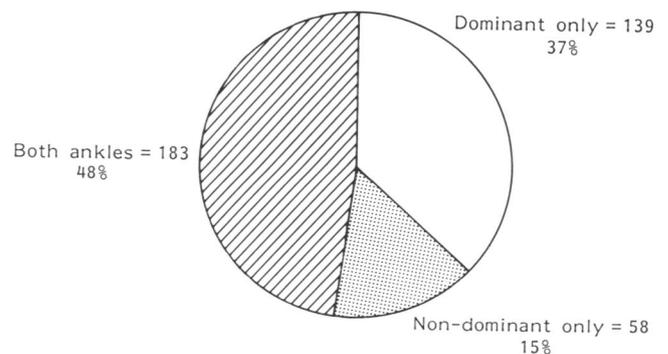


Figure 4. Total number of ankle sprains for 380 athletes

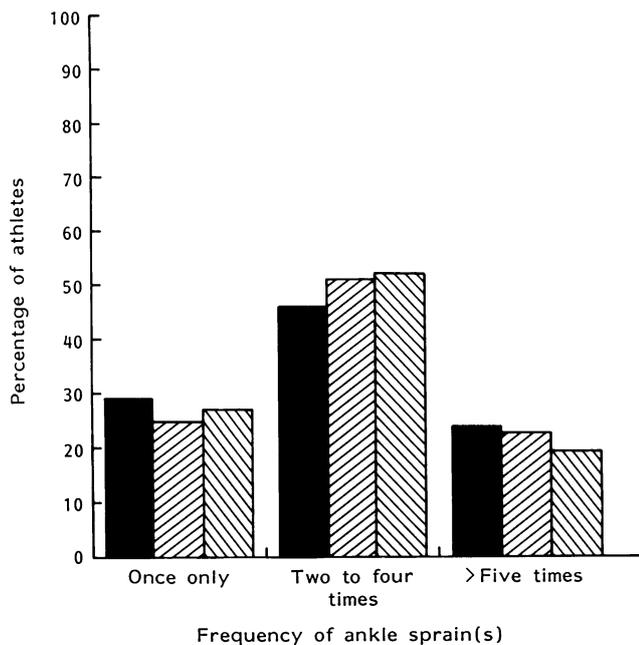


Figure 5. Numbers of ankle sprains in three groups of athletes; ■, national, $n = 64$; ▨, competitive, $n = 177$; ▩, recreational, $n = 125$

Of these 563 sprained ankles, 149 (26.5%) had only been sprained once, while 414 (73.5%) had been sprained at least twice. The recurrence rate of ankle sprains for athletes in this study group was as high as 73.5%. Moreover, 124 (22.0%) ankle sprains were reported to have recurred five or more times. However, when comparing the occurrence rate of ankle sprains among the three groups of athletes, i.e. the national team, the competitive and the recreational athletes, there was no significant difference in occurrence rate of sprains among these three groups ($P > 0.05$) (Figure 5).

Residual problems in ankle sprains

Residual symptoms that athletes complained of resulted from previous ankle sprains and are presented in Figure 6. Of the athletes, 30.2% complained about pain in their injured ankle which was the major complaint. The second most common complaint was the sense of ankle instability (20.4% of athletes), followed by crepitus of ankle joints (18.2% of athletes) and weakness (16.5% of athletes) in the injured ankles.

The injured or sprained ankles were further divided into three subgroups for analysis of various residual symptoms in relation to the frequency of recurrence: group 1 – 149 ankles that had only been sprained once; group 2 – 290 ankles sprained two to four times; and group 3 – 124 ankles sprained five or more times.

Results showed that for any specific ankle there was a trend towards an increase in complaint of residual symptoms with an increase in the number of sprains (Figure 7). For example, only 9.4% of ankles in group 1 had symptoms of residual instability, but instability was complained of for 37.9% of ankles in

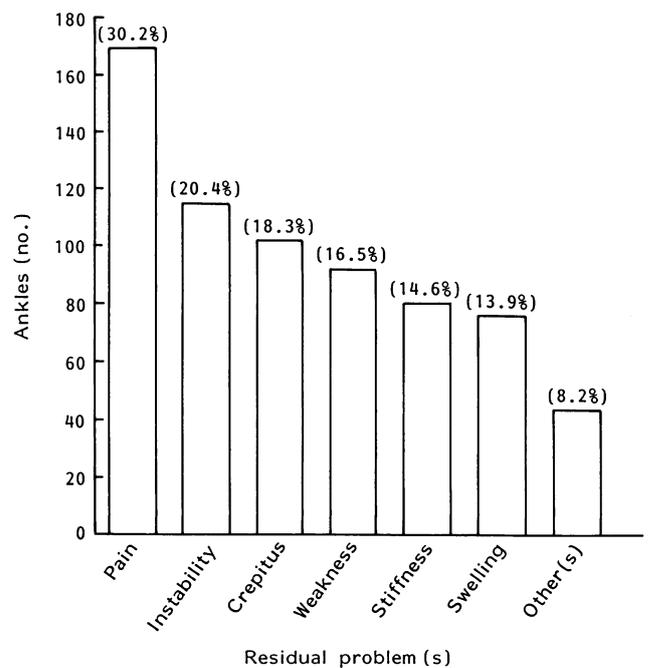


Figure 6. Numbers and percentages of various residual problems of the ankles after sprain(s)

group 3. Ankle instability was complained of four times as often in group 3 than in group 1.

Statistically, athletes with multiple ankle sprains complained more of symptoms of residual crepitus, weakness, instability and stiffness of their injured ankle than those athletes with a single sprain ($P < 0.05$).

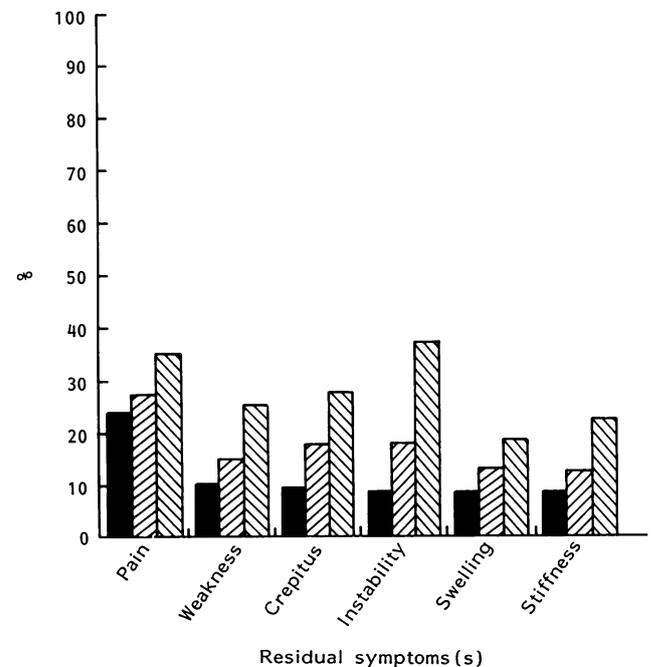


Figure 7. Percentages of various residual symptoms in relation to how many times ankle sprain has occurred; ■, group 1 (149 ankles) sprained once; ▨, group 2 (290 ankles) sprained two to four times; ▩, group 3 (124 ankles) sprained five times or more

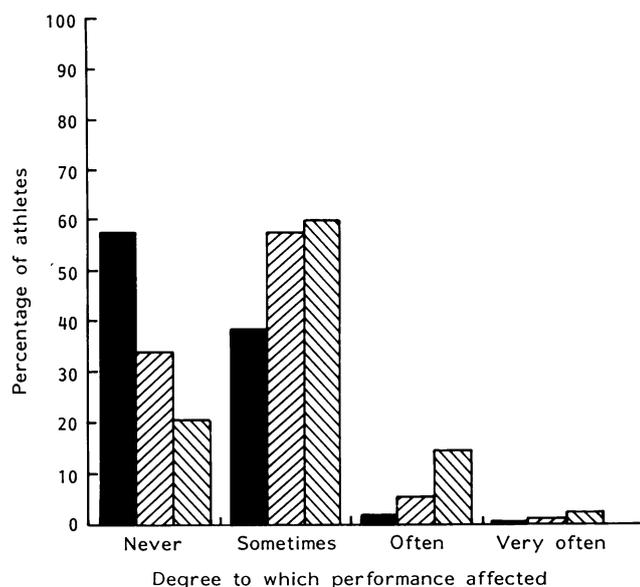


Figure 8. Degree to which performance is affected in relation to number of times ankle has been sprained; ■, group 1 (149 ankles) sprained once; ▨, group 2 (290 ankles) sprained two to four times; ▩, group 3 (124 ankles) sprained five times or more

The relationship between the degree to which athletic performance is affected and the recurrence of ankle sprain is shown in Figure 8. The percentages of athletes complaining that residual symptoms 'often' or 'very often' influenced their athletic performance, were 3.4%, 7.9% and 18.5% for groups 1, 2 and 3 respectively. The results show a trend towards an increase in the degree to which athletic performance is affected with increasing numbers of ankle sprains. Statistical analysis showed that group 3 had a significantly higher incidence of complaints of residual symptoms ($P < 0.05$).

Discussion

The main aims of this epidemiological study were to identify the prevalence of recurrent ankle sprain among the Hong Kong Chinese athletes; to obtain information on the relationship between the number of ankle sprains and residual symptoms; and to determine to what extent the athletes felt that these residual symptoms affected their athletic performance.

For those athletes with unilateral ankle sprain, it was noted that the dominant leg was more vulnerable to sprain than the non-dominant one. Injury to the dominant ankle was 2.40 times higher than to the non-dominant one. Ekstrand and Gillquist¹¹ reported that ankle sprain was more common in the dominant leg ($P < 0.005$) and suggested that the dominant leg was more exposed to force inversion in jumping and kicking by comparison with the non-dominant leg. Cox¹ suggested that when jumping, the foot would naturally fall into plantarflexion and inversion which was a loose-packed position of the ankle joint. At landing, muscles of the ankle, namely the dorsiflexor and the evertor, needed to bring the foot to a more

neutral position. When the timing of the positioning of the ankle during landing was incorrect, ankle sprain might occur.

The Hong Kong National Team athletes who participated in sports more frequently than the competitive and recreational athletes ($P < 0.05$) were expected to have more sprains but this was not the case. The national team athletes did not show a higher incidence of ankle sprains ($P > 0.05$) than the other two groups of athletes. Could it be due to the fact that the elite athletes were more highly skilled and better equipped thereby reducing the incidence of traumatic ankle injuries? Could it be that the national athletes are more aware of the importance of carrying out a proper warming-up and stretching programme, which is often emphasized as a preventive measure for sports injuries?

In this study, only 41% of the injured ankles were reported to be completely symptom free, while 59% of those questioned complained of one or more residual symptom(s) of pain, crepitus, instability and/or weakness in their ankles. Freeman¹² reported that 40% of injuries to lateral ligaments resulted in functional instability. Smith and Reischl⁵ reported that half of the players with recurrent sprains had residual problems, and Staples¹³ reported that only 58.7% of sprained ankles completely recovered after 10.4 years of follow-up. Hansen *et al.*⁴ also reported that 20.8% of patients with ankle sprain had residual symptoms with 3.1–3.6 years of follow-up. Chronic residual symptoms were not uncommon for those who had sustained ankle sprains.

Also in this study, 30.2% of the athletes with ankle sprain had pain around their ankle(s) and it was the major complaint of athletes. Landeros *et al.*¹⁴ reported that chronic post-traumatic anterior ankle instability would lead to chronic pain at the ankle joint and some ankles might have intermittent swelling. Visser *et al.*¹⁵ in his examination of chronic ankle sprains found that residual problems of chronic swelling, persistent pain, popping, insecurity of the ankle and a decrease in activity level were present in his patients.

Residual symptoms of crepitus, weakness, instability and stiffness were significantly higher with increasing frequency of recurrence of ankle sprains ($P < 0.05$). Ankle instability or giving way became the major complaint for athletes with multiple episodes of sprains ($P < 0.05$). This study did confirm the findings of other studies, that functional instability was the major residual problem, especially for those with multiple ankle sprains^{4, 6, 8, 16, 17}.

This study also showed that the degree to which athletic performance was affected was related to the number of occurrences of ankle sprain ($P < 0.05$). Garn and Newton¹⁸ mentioned that high incidence of chronic instability could affect participation in sports related activities. This was especially true for athletes participating at a highly competitive level. This study showed that for the same number of ankle sprains, the degree to which the level of athletic performance was affected was significantly higher in the Hong Kong National Teams than in the competitive athletes and the recreational athletes ($P < 0.05$). This might be due to the more frequent and higher intensity

training required for the national athletes, thus placing more stress on their ankle joints. The training for these athletes is highly demanding – they have to be both physically and mentally 'fit'. Proper rehabilitation would be beneficial for the injuries but often athletes did not seek early medical attention⁵ which would defer proper rehabilitation. It is especially common in an injury like ankle sprain which happens so often and yet appears 'trivial'. Further studies on athletes' attitudes towards their injuries would be useful in the planning of education programmes for the management, prevention and rehabilitation of sports injuries.

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