

A review of cricket injuries and the effectiveness of strategies to prevent cricket injuries at all levels

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Abstract

Objective. This review evaluates the scientific research on cricket injuries, including long-term injury surveillance studies, the consensus statement paper for injury surveillance, specific counter-measures to reduce the risk of cricket injuries and finally identifies areas of future concern.

Results. The literature shows that three major cricket-playing countries, Australia, England and South Africa, have collected long-term injury data. While these sets of data show definite trends, it was not always possible to make direct comparisons between data collected in various countries. As a result a consensus statement paper with regards to definitions and methods to calculate injury rates, incidence and prevalence was developed. The first study using this newly accepted injury surveillance method showed injury patterns in West Indies domestic and national cricket teams. There have been three primary studies carried out with regards to interventions aimed at reducing the risk of injury to fast bowlers. These included a coaching interventions programme, the use of a bowling aid in an attempt to modify bowling technique and a study that evaluated the recommended bowling workloads in young cricketers. The implications of the changes to the laws relating to the bowling action and the increased usage of the sliding stop in fielding are reviewed.

Conclusion. From the review it is evident that there is a need to continue with injury surveillance, as well as a need to continue with and increase the number of studies that evaluate the efficacy of intervention strategies in order to reduce the risk of injury to cricketers.

Introduction

The review of the cricket injury literature shows that three major cricket-playing countries have collected long-term injury data. In Australia the surveillance revealed 886 injuries were sustained by players representing the national and state teams. These data were collected retrospectively from 1995 to 1998 and then prospectively from 1998 to 2005. In England the incidence and nature of injuries to professional cricket players reported 990 injuries that were recorded retrospectively from records of a professional county club by the team physiotherapist (1985 - 1995). In South Africa 1 606 injuries to the national and provincial teams were reported prospectively by the physiotherapists and doctors working with the teams from 1998/99 to 2003/2004. While injury surveillance is fundamental to preventing and reducing the risk of injury, these studies used different injury definitions and methods of collecting and reporting the data, which prevented comparisons of injury rates between countries. As a result a consensus statement paper with regards to definitions and methods to calculate injury rates, incidence and prevalence, was developed in order to provide a standard which allows meaningful comparisons of injury surveillance data from different countries and time periods.

This review evaluates the scientific research into cricket injuries, including long-term injury surveillance studies, the consensus statement paper for injury surveillance, specific cricket injuries countermeasures to reduce the risk of injury, cricket protective equipment, and finally identifies areas of future concern.

Studies using injury surveillance method

The first study using this newly accepted injury surveillance method showed injury patterns in West Indies domestic and national cricket teams, with more injuries having occurred when the national team was on tour than when playing at home. Evidence of the effectiveness of injury prevention countermeasures was reviewed and reveals trials of interventions to reduce lower-back injury in fast bowlers. A 3-year educational programme aimed at improving the bowling technique of young fast bowlers showed a reduction in the mixed bowling action, while a bowling harness showed no significant reduction in certain characteristics of the mixed bowling action. A prospective study to evaluate junior fast bowling workload guidelines found that in some cases the workload exceeded that suggested as appropriate for older

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players and recommended that rest days should be added to the guidelines, as bowling more frequently than every 3 days increases the risk of injury.

A brief review of the literature on the safety aspects of cricket batting equipment including helmets, gloves, pads and clothing, indicates that there are areas where improvements need to be made in order to reduce the risk of injury. The implications of the changes to the laws relating to the bowling action and the increased usage of the sliding stop in fielding, particular by young inexperienced cricketers, were reviewed. From the review it is evident that there is a need to continue with injury surveillance, as well as a need to continue with and increase the number of studies that evaluate the efficacy of intervention strategies in order to reduce the risk of injury to cricketers.

World Congress of Science and Medicine in Cricket

The World Congress of Science and Medicine in Cricket brings together a wide range of professionals including sport scientists, sports medicine specialists, physiologists, academics, administrators and coaches with an interest in cricket, from all major cricket-playing countries around the world. The aim of this congress, which is held every four years during the Cricket World Cup, is to provide a state-of-the-art review of the basic, applied and clinical sciences as they relate to cricket and to offer a forum for integrating knowledge from the contributing sciences which address key areas in the prevention and management of cricket injuries and the enhancement of performance. This has contributed significantly to an increase in cricket research as sport scientists strive to assist players and coaches to achieve optimal performance in this competition.

Injury patterns

Long-term injury surveillance has been conducted in three studies in elite cricket in Australia,⁶ South Africa,⁸ and England³ with the view of identifying injury patterns. Retrospective injury information was obtained from the records of the team physiotherapist for the 54 cricketers who had played for the same county first team in England between 1985 and 1995.³ An injury was defined as the onset of pain or disability caused while training for or playing cricket and which caused the player to seek medical attention. A total of 990 injuries were recorded, with an injury exposure of 17 247 days played and an injury incidence rate of 57.4 injuries per 1 000 days played.

Most injuries were sustained early in the season (April) when the least cricket is played. Bowlers were the most susceptible to injury (70.1 injuries per 1 000 days), followed by the all-rounders, batsmen and wicket-keepers with 55.0, 49.4 and 47.3 injuries per 1 000 days, respectively.

Muscle/tendon strains, contusions/haematomas and ligament/joint sprains were found to be the most common injuries. Most injuries occurred to the lower limbs (45%),

followed by the upper limb (29%), trunk (20%) and head and neck (6%).

The thigh and calf (25%), fingers (14%) and lumbar spine (11%) were the sites most vulnerable to injury. Of the thigh and calf injuries, 72% were muscle/tendon strains and tears. Finger injuries consisted mainly of contusions (40%), fractures and dislocations (29%) and ligament/joint sprains (23%). Of the lumbar spine injuries, 63% involved ligaments and joints, while knee injuries were primarily ligament and joint sprains (28%), tendonitis (27%) and contusions (16%). The primary foot and ankle injuries were contusions/haematomas (41%) and ligament/joint sprains (29%).

In a study in South Africa⁸ 1 606 injuries in 783 cricketers were reported prospectively by the physiotherapists and doctors working with the national and 11 provincial teams over a 6-season period from 1998/99 to 2003/2004. The data collection, using a questionnaire, included biographical data as well as information about the anatomical site of injury, month of injury, activity performed when injured, the diagnosis and mechanism of injury and the recurrence of the injury.

More injuries occurred during first-class matches (32%) with limited-overs (26%) matches and practices and training (27%) resulting in a similar number of injuries, while 15% were of gradual onset, which may have been as a result of a combination of factors such as training, practising and playing matches over a period of time. The chronicity of injuries showed that the majority of injuries were classified as acute injuries (65%), with chronic (23%) and acute-on-chronic (12%) making up the balance.

The injuries occurred during the pre-season (11%) (September), the early part of the season (35%) (October and November), mid-season (18%) (December and January), in the latter part of the season (16%) (February and March) and during the 'off-season' (20%) (April - August).

First-time injuries accounted for 65%, while recurrent injuries from the previous season made up 22% of the injuries. The recurrent injuries were primarily as a result of bowling (38%), overuse (23%) and fielding (18%). The rate of injuries sustained during the season and recurring again during the same season accounted for 12% of the total injuries. Lower-limb injuries accounted for nearly half of the injuries (49%), with the upper limb (23%), back and trunk (23%) and head, neck and face (5%) making up the balance.

Bowling (40%) and fielding and wicket-keeping (33%) accounted for the majority of the injuries, with batting accounting for 17% of the injuries sustained. Of the bowling injuries, 55% were lower-limb injuries and 33% were back and trunk injuries. Of the 39 stress fractures 79% were overuse bowling injuries, with the younger players sustaining 74% of the stress fractures.

The primary mechanism of injury was the delivery and follow-through of the fast bowler (25%), running, diving, catching and throwing the ball when fielding (23%) and overuse (17%), various batting situations such as being struck while batting (7%), running between the wickets (4%)

and batting for long periods at a time (4%), training (4%) and participating in various other sports (3%).

The 1 606 injuries sustained were made up mainly of soft-tissue injuries consisting predominantly of muscle injuries (sprains (491); tears (74); spasms (101); haematomas (85)), tendon injuries (tendonitis (107); tears (44)), ligament sprains (76), fractures (63) and stress fractures (39), joint injuries (rotator cuff (50); impingements (42); dislocations (8)).

Information on injuries to Australian state and national cricketers was collected retrospectively for the first 3 seasons (1995 - 1996 season to 1997 - 1998 season) years and then prospectively for the next 7 seasons (1999 - 2000 season to 2004 - 2005 seasons).⁶ The definition of injuries was an injury or medical condition that prevents a player being available for selection for a match or causes a player not to be able to bat, bowl or keep wicket during a match.

Of the 886 injuries recorded, 92% were new injuries, while 8% were recurrent injuries. Of these, 52% occurred during major matches. The injuries were sustained while bowling (45%), batting (21%), fielding (23%) and wicket-keeping (2%). The balance of the injuries (9%) either occurred gradually or in unknown activities. Lower-limb injuries accounted for nearly half of the injuries (49.1%), with the upper limb (24.5%), back and trunk (18.6%), head, neck and face (4.3%) and illness (7.3%) making up the balance.

The mean seasonal injury match incidence (injuries/10 000 player hours) was reported for domestic 1-day (38.5), first-class (27.3), ODI (59.8) and test (31.4) matches. Fast bowlers miss about 16% of potential playing time through injury while for other positions it is less than 5%.

There is an increased non-significant risk of injury when bowling in the second innings of a 1-day match, while a significant risk for the second innings of a first-class match as compared with the first innings. Further, bowling after enforcing the follow-on in a test match is associated with an increase in injury. There is an increased risk of injury when bowling in the second match of back-to-back matches where there is less than 1 and 3 days for 1-day and first-class matches, respectively.

While these data collected over an extended period show definite trends, it was not always possible to make direct comparisons between data collected in various countries. Following the 2nd World Congress of Science and Medicine in Cricket that was held in South Africa in 2003, a method of injury surveillance for international cricketers has set out definitions and methods of calculating injury rates which would allow comparisons to be made between countries and will assist in the identification of injury trends and risks on a broader scale which will further benefit the cricketers.⁷

The first reported study using the internationally agreed injury surveillance protocol,⁷ as well as the first published study on West Indies cricket injuries, reported that 33 international and 162 domestic cricketers sustained 79 injuries.⁴ Of these injuries, 50 led to part of a match being missed and were thus used for match injury incidence and prevalence calculations.

Most injuries were sustained in test and first-class matches (40%) and 1-day matches (28%), with 28% sustained in activities outside of matches.

New injuries accounted for 80% of the total number of injuries, with recurrent injuries from the previous season (10%) and the same season (10%) making up the balance of the injuries sustained. Bowlers (46%) and batsmen (40%) were found to be at the greatest risk of injury, with the balance of the injuries sustained by the all-rounders (10%) and wicket-keepers (4%). Muscle injuries (26%) most common, followed by ligament injuries (12%), stress fractures (12%) and fractures (10%). Two players were struck by lightning in the same match.

Injury incidence for test and 1-day international (ODI) matches (48.7 and 40.6 injuries per 10 000 player-hours for test and ODI matches, respectively) was lower for home matches (31.1 and 23.1 injuries per 10 000 player-hours for test and ODI matches, respectively) than away matches (61.3 and 50.2 injuries per 10 000 player-hours for test and ODI matches, respectively). The injury incidence for domestic first-class and limited-overs matches was 13.9 and 25.4 injuries per 10 000 player-hours, respectively.

The prevalence of injury for test and ODI matches (11.3 and 8.1% of players unavailable for selection due to injury, respectively) was lower for both home tests and ODI matches (7.3% of players unavailable for selection for both test and ODI matches due to injury) than away matches (14.2 and 8.6% of players unavailable for selection due to injury for test and ODI matches, respectively).

These studies briefly have shown that injury data have been collected since the mid-1980s in four of the major-cricket playing countries. However, while the internationally accepted consensus paper agreeing on the method of collecting injury data will allow comparisons between studies conducted throughout the world, limited intervention studies have been carried out in an effort to reverse the injury pattern.

Intervention studies

Three primary studies carried out with regards to interventions aimed at reducing the risk of injury to fast bowlers. These included a coaching interventions programme,² the use of a bowling aid in an attempt to modify bowling technique¹⁰ and a study that evaluated the recommended bowling workloads in young cricketers.¹

The 3-year coaching educational intervention study² consisting of two groups of young fast bowlers demonstrated that small-group coaching significantly reduced the level of shoulder alignment counter-rotation, as well as the incidence and progression of lumbar disk degeneration in young fast bowlers. There was a concurrent reduction in the number of bowlers using a mixed action. Bowlers with either a front-on or side-on action ($N=49$) had significantly lower levels of lumbar disk degeneration ($N=1$) compared with 20 of the 94 mixed-action bowlers who sustained a lumbar disk abnormality. A third of the subjects continued to employ shoulder rotation

beyond the recommended level after the intervention ceased. The results indicated that technique modification using an education process decreased the incidence and/or progression of lumbar spine disk degeneration, but more specific and intense individual coaching should further reduce the risk of injury.

A bowling harness, which was designed to modify bowling technique, was assessed as a means of modifying bowling technique in young bowlers.¹⁰ No statistically significant effect on mean shoulder alignment counter-rotation, mean lateral flexion angle, mean flexion-extension angle of the trunk resulted due to the coaching programme. A decrease in the use of the side-on mixed bowling action was found in the group using the bowling harness. Bowling with the harness forced the bowler to adopt a position at back-foot impact that reduced the torque in the spine. However, during the delivery phase no restricts on other aspects of trunk movement previously associated with back injuries were found. The effect of the harness did not extend beyond the cessation of harness wearing. It was recommended that the harness be re-configured in an attempt to control the shoulder separation angle at back foot impact as well as counter-rotation of the shoulder at front foot strike.¹⁰

Young cricketers (12 and 17 years) playing club and district cricket were monitored over a season in order to evaluate the appropriateness of bowling workload guidelines set by the Australian Cricket Board.¹ All bowlers underwent a magnetic resonance imaging (MRI) scan at the start of the season and then immediately after any back or trunk injury. They were required to maintain a logbook where they recorded any injuries and their bowling workload. Bowlers tended to conform to the recommended number of deliveries to be bowled per match day, but bowled in excess of the recommended guidelines for practice sessions. Of the 44 bowlers, 11 reported over-use bowling-related injuries, with 7 sustaining back injuries. The study showed a relationship between a high bowling workload and injury. The injured players bowled more frequently and had shorter rest periods between bowling sessions (3.2 days) than the uninjured (3.9 days). The bowlers with an average of ≥ 3.5 rest days between bowling were at a significantly less risk of injury than those with an average of < 3.5 rest days. Further, the results showed an increase of risk for the bowlers who bowled ≥ 50 deliveries per day or who bowled on average ≥ 2.5 days per week.

From the above it is evident that the various strategies and interventions carried out have shown some success in reducing some risk factors associated with back injuries in fast bowlers. However, recent law changes to the game now allow a legally bent arm action, with or without elbow extension, during the delivery phase. This has allowed the bowler to increase the ball speed/spin through internal rotation of the upper arm. While the traditional bowling technique causes low levels of varus and valgus torques and flexion torques at the elbow joint in order to provide stability,⁵ the law changes have increased the injury potential as the upper arm internal rotation results in excessive varus torques, similar to those in baseball pitching. Torques generated by ligament and capsule results in the potential for increase in injury and may require changes to bowling guidelines to prevent elbow damage.⁵

A further area of concern is the potential risk of injury to cricketers using the relatively new sliding stop technique.⁹ This requires the fielder to chase the ball which is slightly to the left, in the case of a right handed thrower. The fielder then slides with the right leg extended and the left knee flexed under the right leg, sliding on the left buttocks and hip area with the left hand used for balance. The ball is then picked up with the right hand, the right foot is engaged with the ground and the left hand pushes on the ground to bring the fielder upright and in position to throw.

The sliding stop may have advantages at higher level of the game, but at the lower levels, particularly at school level, the correct technique is not taught and/or practised and may predispose to injury.⁹ If the right foot is not engaged and the left hand not used to push up it may result in the left leg having to be extended while weight-bearing with the rotational forces used to pivot on the left knee resulting in a meniscal tear. The sliding technique should be discouraged as a means of fielding in cricket unless appropriately coached.⁹

Conclusion

From the review it is evident that there is a need to continue with injury surveillance, as well as a need to continue with and increase the number of studies that evaluate the efficacy of intervention strategies in order to reduce the risk of injury to cricketers. Further, before law changes are introduced by cricket administrators, this needs to be thoroughly investigated to ensure that the risk of injury to cricketers is not increased.

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