

Long-term injury consequences of playing baseball

**A report to the New South Wales
Sporting Injuries Committee**

by

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Thank you.

Mr. Rudi Meir and Associate Professor Robert Weatherby

Summary of Findings:

This study involved a retrospective survey of retired baseball players in order to establish any long-term consequences associated from injuries sustained during their playing careers. The survey was completed by 75 retired baseball players (from 204 invitations) representing a 37.8% response rate.

Player History:

1. Mean age of respondents 55.8 (± 11.4) years
Mean age when ceased playing baseball 41.3 (± 11.4) years
Mean total time spent playing was 27.2 (± 10.9) years
2. 14.6% represented their local association, 24% played at state level, 46.7% represented Australia, 2.7% played professionally in the USA and 12% had no representative experience at all.
3. 26.7% were pitchers, 13.3% were hitter-outfielders, 32% were hitter-infielders and 26.7% were catchers.
4. 89.3% were employed full-time during their baseball careers mostly working in office work and trades.

Injuries sustained whilst participating in baseball:

5. The main reasons for retiring from participation in competitive baseball were age 33%, combination of age and injury 25.3% and injury 14.7%.

88% of respondents reported experiencing an either a significant and/or major injury during their playing careers.

The mean injury rate of the respondents during their playing career was 5.6 (± 7.1) injuries.

54.7% of respondents experienced a major injury resulting in them missing five or more consecutive weeks of training or playing.

The mean major injury rate was 1.5 (± 2.2) per respondent.

83% of all injuries were sustained during play.

The most common form of injuries were sprained ankles, hamstring strains, rotator cuff injury to the shoulder and tendon or ligament damage to the elbow or lower arm.

Catchers had significantly less injuries than all other positions. However, there was no significant difference in the rate and severity of injuries between any of the other playing positions.

Hospital use arising from injuries:

6. 54.7% of respondents required a hospital visit as a result of injury sustained during their baseball career. This resulted in an average hospital stay of 3.5 (± 9.3) days for this group (n=41). Respondents reported 3 cases of joint replacement and 7 cases of joint reconstruction resulting from participation in baseball.

Medical conditions identified as being associated with injuries sustained from baseball participation:

7. 18.7% of all respondents reported currently suffering from arthritis, 24% were suffering from restricted joint mobility and 4% reported suffering from chronically stiff fingers; all of these conditions were associated with their participation in baseball based on medical examination by their GP or medical specialist.

46.7% of all respondents were suffering from arthritis at the time of the survey with 12% of these taking medication for this condition. However, just 4 respondents had indicated that their arthritis was linked to their participation in baseball. 18.7% of respondents were taking anti-inflammatory medication and 10.7% were taking analgesics at the time of the survey but this was not linked to conditions associated with their participation in baseball.

6.7% of respondents were currently seeing a physiotherapist while 53.3% had sought physiotherapy treatment as a result of injuries sustained during their baseball career. 8% were currently seeing a medical doctor and 5.3% were seeing a medical specialist for treatment related to injuries sustained during their career. 5.3% were seeking treatment from an alternative therapist to treat injuries sustained during their playing career.

Financial and lifestyle implications arising from injuries:

8. 29.3% of respondents indicated that they believed they had incurred additional medical costs associated with their injuries that were not covered by their health insurance or club.

12% perceived that they had significant loss of income due to extended periods of recovery and/or rehabilitation from their injuries.

5.3% perceived that their injuries had impacted on their ability to perform work for which they had been previously trained.

26.7% perceived that they were currently experiencing limitations in their ability to carry out normal recreational activities.

Conclusions:

Despite the limitations of a small sample size a valuable snapshot of injuries and injury consequences has been provided of retired Australian baseball players. Typically it

appears the career length of a player is quite long and while the average rate of injury across a career was reported at 5.6 given the length of time (mean 27.2 yrs) spent actively involved in the sport this could not be considered high. However, some injuries were severe enough that they did result in extended stays in hospital which results in a cost carried by the medical system. Injuries sustained by players played a role in their decision to stop participating in the sport and injury also had consequences for some players long after they ceased playing.

Recommendations:

1. injury prevention strategies should be implemented in baseball and targeted generally across all players;
2. attention should be made to areas in which injuries most frequently occur e.g. the ankle, hamstrings and shoulder;
3. as in other sports arthritis, restricted joint mobility and chronically stiff fingers affect current lifestyle after retirement from participation. As a result prevention strategies should be developed to target these conditions;
4. further analysis is needed to establish the true cost of injury on the medical system; and
5. given the relatively small sample participating in this current research further analysis is needed involving a larger sample before these results can be considered indicative of retired players in this sport.

1.0 Introduction:

1.1. Current research

Little is known about the long term effects and ramifications of injuries sustained through sporting involvement on the later life of an athlete. It appears that injuries sustained when training for, or playing sport impact on the athlete in varying ways and to differing extents later in life (Turner et al. 2000; Larsen et al. 1999; Knowsley 1998; Meir et al. 1997; Inklaar 1994). These impacts may be measured by studying the individual sportsperson's current health status and quality of life, as well as viewing the direct and indirect costs over time that are associated with these injuries. Employment status and the ability to maintain chosen employment following sports injuries are also factors that impact directly on the player's future life.

Previous research has examined the long term consequences of injury on participants in rugby league (Meir et al. 1997; Weatherby et al. 1999a & b) and cricket (Noble-Jerks et al. 2004). In a study involving 116 retired Australian and English rugby league players it was found that approximately 76% of players sustained at least one major injury during their playing career whilst 25% of the players reported having 4 or more major injuries during their playing careers. Major injuries sustained during a player's career were linked to such conditions as arthritis, chronic back pain, restricted joint mobility and joint replacement surgery. In some cases these conditions led to early retirement from play, ongoing medical costs incurred after retirement from play, limitations with respect to the type of vocation that can be undertaken and loss of income (Weatherby et al. 1999a).

Research (Noble-Jerks et al. 2004) involving 164 retired representative level cricketers found that approximately 18% sustained a major injury during their careers and 82% sustained a significant injury. Major injuries were most commonly associated with the ankle, back and hand. This research reported a range of medical conditions linked to involvement in cricket including, arthritis, chronic back pain, dental problems and restricted joint mobility. 6.7% of respondents indicated that their participation in cricket and subsequent injury record had affected their ability to work in their chosen profession. 10.4% indicated that they had incurred medical costs associated with their cricketing

injuries and 2.4% indicated that they had experienced some loss of income.

1.2 Baseball: A brief overview

The United States of America is the birthplace of baseball and the sport is second in popularity in that country only to basketball (Mueller et al. 2001). It is played in over 100 countries around the world and is a popular Australian team sport played in every state of Australia with some 59,000 registered junior and senior participants (Australian Baseball Federation). Baseball was first introduced to Australia by American goldminers in 1856 and was introduced to Sydney in 1888. Competitive leagues for both men and women exist throughout Sydney and country NSW.

Played in sometimes very extreme conditions, baseball is a complex game involving 2 teams of 9 players and requires both physical and mental fitness, with the ability to concentrate for long periods of time being a prime requisite. Games may take hours to play yet the nature of physical involvement places high demands on quick, explosive and reactionary movements (DeRenne 1990). Baseball is generally considered a non-contact sport in nature but collisions can occur with other participants and objects that may result in injury. As a sport baseball places importance on muscular strength and endurance, cardiovascular endurance and overall flexibility. Players must be quick, strong and agile while being able to display these qualities in sport specific movements and sequences (DeRenne 1990). These qualities, combined with appropriate skill and body composition, are closely linked to successful performance (Potteiger et al. 1992). Baseball has been described as an anaerobic sport in terms of energy production and physical conditioning (Fox 1984). Notwithstanding this, it has been claimed that many baseball players lack the levels of fitness and conditioning seen in participants of other competitive sports (Montes 2001). However, little has been published about the physiological demands on baseball players during training or the game situation. These demands may place the body under varying degrees of stress that may ultimately result in injury. Given the popularity of this sport worldwide it is surprising that only limited research data on the sport exists when compared to that for other sports (Coleman & Lasky 1992).

2.0 A brief review of the literature:

2.1 Baseball injuries

It has been claimed that baseball has high rates of injury and participation can even be fatal with 88 deaths recorded in the USA between 1973 and 1995, more than any other sport. Further, during the period 1987 to 1996 there were thirteen fatalities recorded in Little League baseball players in the USA (Mueller et al. 2001). Various types of injuries have been linked to baseball participation and include injury to the wrist and hand, sprains, fracture dislocations, dislocations, tendon ruptures, lacerations and contusions (Rettig 1998). According to Nicholls and co-workers (2004) baseball has one of the highest impact injury rates of all sports with these injuries primarily attributed to impact by a ball after it has been hit, pitched or thrown. However, some impact injuries also result from hitting another player or objects (Rettig 1998).

Injuries to the shoulder and elbow are common in sports involving throwing. Shoulder injuries are reportedly the most common in baseball accounting for 19% of all injuries while the elbow accounts for 8% (Lachowetz et al. 1998). With respect to the shoulder, baseball, by its very nature, is a ballistic sport reflected in the arm actions of throwing and hitting (DeRenne 1990; Jeran & Chetlin 2005). According to Plancher and Minnich (1996):

overhead throwing can lead to chronic injuries in the elbow. The pitching motion transmits high levels of kinetic energy through the length of the arm, producing large torques on the musculoskeletal components. The resulting injuries include medial tension overload, lateral tension and compression injuries, posteromedial shear stress, and, in the pediatric [sic] athlete, 'Little League elbow' (p. 210).

In the young baseball player the demands of throwing places particular stress on the immature elbow making it vulnerable to injury with the repeated throwing stresses producing a range of pathologic conditions (Plancher & Minnich 1996; Whiteside et al. 1999), which may result in not only decreased performance but also withdrawal from play. Little league elbow is an injury, which if correctly diagnosed, will typically resolve

with a break from the offending activity but in some cases it can lead to a more serious and "...potentially disabling epiphyseal injury" (Andrish 1997, p. 86).

The high speeds at which baseball players attempt to accelerate the ball is associated with an injury commonly referred to as the "dead arm". This injury is relatively common within baseball and is "...a pathological shoulder condition in which throwers are unable to throw with their preinjury velocity and control because of a combination of pain and subjective unease in the shoulder" (Burkhart et al. 2000, p. 126).

2.2 Possible adverse outcomes of injury

The potential adverse outcomes of sport and physical activity injuries, as outlined by Finch and Owen (2001) are:

1. Prevention or limitation of participation:
 - i) leading to time lost from sport/physical activity
 - ii) leading to non-participation
 - iii) limiting athletic participation/performance (in terms of frequency, duration, etc.)
 - iv) limiting performance (achievements), whether or not there is also time lost to sports/physical activity
 - v) being potentially career threatening to elite athletes and others who can no longer perform their work
2. Affecting the health of participants by:
 - i) causing permanent physical, psychological or emotional damage and disability
 - ii) creating significant treatment needs (e.g. surgery, ongoing management, etc.)
 - iii) creating significant rehabilitation needs
 - iv) resulting in fear of future injury
 - v) resulting in non-participation and subsequent implications for future health status
3. Significant financial costs:

- i) resulting in health system expenditures such as health insurance costs and costs of insurance against injury
- ii) being associated with other financial costs to the individual (e.g. protective equipment such as braces)
- iii) being associated with significant costs to industry (both sporting and employment)
- iv) being associated with loss of potential income for individuals and sporting clubs/organisations
- v) being associated with time away from school/work/home duties.

It is important to bear in mind that time away from work or sporting participation immediately following injury may not be a valid criterion for calculating potential economic cost of an injury. Dependent on medical care available to the athlete (which, in turn is often determined by the level of competition, or the socio-economic status of the athlete), time away from work or sport may be an eventual cost saver. Good medical care may lengthen the time taken away from work or sport to enable complete rehabilitation, which may enable the athlete to return to work or sport earlier. Conversely, a sportsperson who returns to work or sport immediately following an injury may incur further costs due to reinjury or exacerbation of injury by activity too soon (Inklaar 1994). Previous research has raised the issue of professional players in rugby league being covered under state workers compensation legislation (Weatherby et al. 1999b). Injury associated with sport and physical activity can potentially result in significant health care costs and consequent disabilities and reduced mobility may result in inactivity. This in turn may increase the risk of cardiovascular disease and other health problems (Finch & Owen 2001).

In conclusion, participation in sport is a major source of injury to Australians, yet little research has focused on the long-term impact major injuries may have on participants later in their life. It is possible that the medical system and the individual may incur ongoing costs associated with these injuries. Further, for the individual a major injury or repeat injury during their participation in sport may negatively impact on their ability to perform simple daily tasks or even participate fully in their chosen area of employment.

This study examined the injury recall of participants in one of Australia's major competitive sports in an effort to determine if they had experienced negative economic and lifestyle (quality of life) consequences that have carried over into the post retirement period from competitive participation.

3.0 Aims and objectives

The aim of this project was to determine what impact (major and significant) injuries sustained during participation in competitive baseball have on players' post participation. Post participation may be up to 30 years after retirement from playing.

The research investigated the type and incidence of injuries sustained, if any, and the effects these injuries had on the player's life following cessation of baseball participation by use of a retrospective survey of former baseball players. Factors such as injury history, playing history and level of participation, nature of employment during playing career and use of private insurance and health systems were considered. The project is significant in that it determined long-term physical, health, economic and other factors that can be identified which it may be possible to change for current players and thus create healthier future players and minimise future injury consequences.

4.0 Methods:

4.1 Subjects

A sample of 204 retired players were invited to participate in the study by direct mail shot. The mailing list of potential participants was generated from the membership databases developed by the Australian Baseball Federation (ABF) and the Far North Coast (FNC) Baseball Association. The ABF and FNC Baseball were both responsible for identifying those retired members who would receive the survey package. At no time did the principal researchers have any knowledge of the name and mailing addresses of possible participants identified on the two mailing lists.

4.2 Survey design

The survey tool sent to potential participants used a combination of “yes/no”, checklist and simple response questions. The survey tool was developed specifically for this study but was adapted from a survey utilised in similar research involving retired rugby league and cricket players (Noble-Jerks et al., 2003; Weatherby et al., 1999a). The survey tool was 13 pages long (see Appendix 2.0) and had a total of 27 major questions; some questions had sub-sections that required a response from participants. The survey covered six categories relating to the following areas:

1. Personal details
2. Playing history
3. Employment history
4. Injury/medical history
5. Impact of injuries
6. Training and game preparation

Each subject area addressed separate issues of concern to the study.

Each potential participant received a package containing the survey, an explanatory cover letter (see Appendix 1.0) and a reply paid addressed envelope in which to return the completed survey form.

Ethics approval for the project was granted by the Southern Cross University Human Research Ethics Committee (ECN-04-184). After the initial development of the survey form, it was distributed to relevant experts in the sport/sports injuries field for input and feedback regarding face validity and relevance of questions. This group was comprised of one physiotherapist with experience at an international level within the sport of baseball, one sports medicine physician, two sports scientists and a senior member of New South Wales Baseball with experience in player development. This process resulted in a number of small changes being made to the survey tool. Once these changes were made the final version of the survey was submitted to the University Ethics Committee for their records.

4.3 Definitions of major and significant injury

For the purposes of this project, a **major** injury was defined as an injury that resulted in more than five consecutive weeks of training or playing being missed. A **significant** injury was an injury that resulted in more than one week, but less than five weeks of training or playing being missed.

4.4 Statistical analysis

SPSS 11.5 was used for all statistical analysis. As the number of major, significant and total injuries were significantly positively skewed, a natural logarithmic transformation was applied to the counts of injuries in each category [$\ln(\text{number of injuries}+1)$].

An analysis of variance (Type 3 unique effects) was performed on each of the transformed variables; number of major, significant and total injuries, with the covariate of years spent playing baseball and factors, level of competition played (4 levels – local, state, semi-professional, national) and playing position (4 levels – pitcher, outfield-hitter, infield-hitter, catcher). Type 3 unique effect analysis of variance gives the significance of each factor after adjusting for the other covariates and factors.

An alpha level of $p < 0.05$ was used for all statistical comparisons. Borderline effects were also indicated at the $p < 0.10$ level. All data were summarised using descriptive statistics (mean [\pm SD]) and percentages.

5.0 Results:

5.1 Personal details and playing history

A total of 6 survey packages were returned because the postal address was either incorrect or the sender was no longer at the stated address, therefore only 198 of 204 packages distributed were actually delivered. A total of 75 completed surveys were returned for analysis representing a 37.8% return rate. A further 2 completed surveys were not included in the analysis because they were completed by respondents who were still playing.

The average age of respondents at the time of completing the survey was 55.8 (± 14.7) years. The average age that respondents started playing as a registered player was 13.8 (± 5.7) years and the average age at which they stopped playing in an organised competition was 41.3 (± 11.4) years. On average the respondents spent 27.2 (± 10.9) years playing with a number of players in their 60s and 70s still playing in Masters Games competitions one week per year. A total of 11 respondents had represented their local association, 18 had played at a state level, 2 had been professional players, 35 had represented Australia and 9 had no representative experience at all.

Respondents were asked to identify the playing position that they mainly played during their career (see table 1) along with their handedness for the major playing activities of hitting/batting, pitching and throwing (see table 2). Table 3 summarises the reasons why respondents retired from participation in competitive baseball. In addition to those reasons provided in table 3 a range of "other" reasons were provided from six of the respondents and these included becoming involved in coaching/administration of the game, taking up another sport, and moving overseas to work.

Table 1: Playing position of respondents (N=75).

| Position | n | % |
|---------------------|----|------|
| Pitcher | 20 | 26.7 |
| Hitter – Outfielder | 10 | 13.3 |
| Hitter – Infielder | 24 | 32.0 |
| Catcher | 20 | 26.7 |
| Total* | 74 | 98.7 |

N.B.: Not all respondents responded to this question.

Table 2: Handedness for playing activities of respondents (N=75).

| Playing Activity | Right hand n* | Left hand n* |
|------------------|------------------|-----------------|
| Hitting/Batting | 59 | 15 |
| Pitching | 41 | 5 |
| Throwing | 64 | 9 |

N.B.: Not all respondents responded to this question.

89.3% of respondents were employed full-time during their baseball playing careers, with two playing professional baseball in the USA. The remaining 10.7% were either employed part-time, unemployed or full-time students. The majority of respondents were employed in office work with the next most popular employment category being in some form of trade (e.g. building and construction, etc.). These two categories of employment accounted for 54.7% of all responses. Similarly after retirement from the game 52.0% of respondents continued to work in these two areas of employment.

Table 3: Reason for retiring from participation in competitive baseball.

| Reason | n | % |
|-------------------------------|----|------|
| Injury | 11 | 14.7 |
| Age | 25 | 33.3 |
| Combination of age and injury | 19 | 25.3 |
| Time constraints | 2 | 2.7 |
| Work/Family commitments | 8 | 10.7 |
| Lack of interest/motivation | 4 | 5.3 |
| Other | 6 | 8.0 |
| Total | 75 | 100 |

5.2 Injury and medical history

Table 4 shows that a total of 242 injuries were reported by 66 (88%) respondents during their playing careers. Nine respondents reported no incidence of major or significant injury during their playing career. However, respondents may have experienced more than one of the same type of injury during their playing career (see table 8). Of the 371 separate incidents of injury reported by respondents, 98 (26.4%) were considered major and resulted in more than 5 weeks being missed from playing or training while 273 (73.6%) were considered significant resulting in more than one but less than 5 weeks playing or training being missed. This reflects an overall mean injury rate for those respondents reporting an injury during their career of 5.6 (± 7.1). With respect to major and significant injuries this represents a mean rate of 1.5 (± 2.2) and 4.1 (± 6.5) respectively.

Table 4: Site and type of injury reported by retired baseballers during their playing career (n=66).

| Site of body | Type of injury | Total | % |
|------------------------|---|-------|-----|
| Head and facial | Concussion | 8 | 3.3 |
| | Fractured (broken) nose | 8 | 3.3 |
| | Fractured (broken) jaw | 1 | 0.4 |
| | Eye Injury | 4 | 1.7 |
| Neck | Muscular injuries | 6 | 2.5 |
| | Ligament damage | 4 | 1.7 |
| Back | Fractured (broken) vertebra | 2 | 0.8 |
| | Muscular injuries (upper back) | 2 | 0.8 |
| | Muscular injuries (lower back) | 6 | 2.5 |
| | Disc injury of the lumbar or thoracic spine | 1 | 0.4 |
| | Tendon or ligament damage | 3 | 1.2 |
| Shoulder | Shoulder dislocation | 3 | 1.2 |
| | Acromioclavicular (AC) joint dislocation or subluxation | 1 | 0.4 |
| | Clavicle fracture | 2 | 0.8 |
| | Rotator cuff injury | 15 | 6.2 |
| | Muscular injury (shoulder or upper back) | 4 | 1.7 |
| | Tendon or ligament damage | 11 | 4.5 |
| | Nerve injury to shoulder or upper arm | 3 | 1.2 |
| Reconstructive surgery | 4 | 1.7 | |

Table 4 continued over page...

Table 4 continued...

| Site of body | Type of injury | Total | % |
|-------------------|--|-------|-------|
| Elbow and Forearm | Fractured (broken) forearm | 3 | 1.2 |
| | Fractured (broken) wrist | 4 | 1.7 |
| | Nerve injury or entrapment | 2 | 0.8 |
| | Tendon or ligament damage | 15 | 6.2 |
| Hand | Finger dislocation | 8 | 3.3 |
| | Fractured (broken) finger | 10 | 4.1 |
| | Tendon or ligament damage | 4 | 1.7 |
| Chest/Abdomen | Fractured (broken) ribs | 3 | 1.2 |
| | Fractured (broken) sternum | 1 | 0.4 |
| | Cartilage injury of ribs | 3 | 1.2 |
| | Abdominal strain injuries | 4 | 1.7 |
| Groin | Muscular injuries | 9 | 3.7 |
| | Tendon injury | 1 | 0.4 |
| Hip and Thigh | Quadriceps strain | 1 | 0.4 |
| | Hamstring strain | 16 | 6.6 |
| | Other muscular injuries | 5 | 2.1 |
| | Tendon or ligament damage | 1 | 0.4 |
| Knee | Cartilage tears that required surgery | 12 | 5.0 |
| | Anterior Cruciate Ligament (ACL) injury | 5 | 2.1 |
| | Posterior Cruciate Ligament (PCL) injury | 2 | 0.8 |
| | Medial Collateral Ligament (MCL) injury | 6 | 2.5 |
| | Patella tendon injury | 2 | 0.8 |
| | Reconstructive surgery | 1 | 0.4 |
| Ankle | Sprained ankle (ligament damage) | 22 | 9.1 |
| | Fractured (broken) ankle / shin bone | 5 | 2.1 |
| | Tendon or ligament damage | 3 | 1.2 |
| | Muscular injuries | 4 | 1.7 |
| | Fractured (broken) bones of the foot | 2 | 0.8 |
| Total | | 242 | 100.0 |

As can be seen from table 4, sprained ankles were the most common injury (9.1%), followed by hamstring strains (6.6%), rotator cuff injury to the shoulder (6.2%) and tendon or ligament damage to the elbow or lower arm (6.2%).

Statistical analysis found no significant interaction between level of competition and playing position with any of the transformed severity of injury variables i.e. number of

major, significant and total injuries ($p=0.411$, $p=0.284$, $p=0.501$ respectively). Table 5 details the significance levels for the covariate and factors for each severity of injury variable. Table 6 presents the estimated marginal means and standard errors for the In transformed data and back transformed to original count measurements using the log normal distribution properties outlined in J.K. Lindsay (2004, p. 214) Introduction to applied statistics: A modelling approach. This analysis was conducted on a total of 59 respondents providing complete information on all factors included in the models.

For the significant results demonstrated in table 5, results of significant posthoc tests (non adjusted) are presented in table 7. The position of catcher (mean=1.06, se=0.27), had significantly lower numbers of major injuries than any other position; pitcher (mean=2.65, se=0.41), hitter-outfielder (mean=2.58, se=0.57), hitter-infielder (mean=3.28, se=0.42). There was also a non-significant trend toward a higher number and severity of injuries being experienced by semi-professional/professional players.

Table 5: Significance levels for the covariate and factors for each severity of injury variable.

| Severity of Injury | Years playing baseball df=1 | Representative level df=3 | Position played df=3 |
|--------------------|--------------------------------|------------------------------|-------------------------|
| Major | 0.285 | 0.087† | 0.027* |
| Significant | 0.867 | 0.250 | 0.737 |
| Total | 0.776 | 0.069† | 0.210 |

* denotes significance at the $p < 0.05$ level

† denotes borderline effect at the $p < 0.10$ level

Table 6: Estimated means and standard errors for transformed data and back transformed to original counts by level of injury, representative level and position played for respondents (n=59).

| Injury Level | Factor | Levels | n | Transformed $\ln(x+1)$ | | Original Scale (back transformed) | |
|--------------|----------------------|---------------------------------|----|------------------------|------|-----------------------------------|-------|
| | | | | Mean | SE | Mean | SE |
| Major | Representative level | Local | 10 | 0.77 | 0.20 | 1.65 | 0.41 |
| | | State | 14 | 0.50 | 0.16 | 0.99 | 0.27 |
| | | Semi-professional/ Professional | 2 | 1.68 | 0.43 | 5.42 | 1.65 |
| | | Aust rep | 32 | 0.76 | 0.11 | 1.61 | 0.22 |
| | Position played | Pitcher | 16 | 1.03 | 0.18 | 2.65 | 0.41 |
| | | Hitter-Outfielder | 8 | 1.05 | 0.24 | 2.58 | 0.57 |
| | | Hitter- Infielder | 19 | 1.15 | 0.18 | 3.28 | 0.42 |
| | | Catcher | 15 | 0.49 | 0.18 | 1.06 | 0.27 |
| Significant | Representative level | Local | 10 | 1.28 | 0.29 | 4.45 | 1.61 |
| | | State | 14 | 1.28 | 0.23 | 4.26 | 1.20 |
| | | Semi-professional/ Professional | 2 | 2.53 | 0.61 | 17.14 | 12.68 |
| | | Aust rep | 32 | 1.25 | 0.16 | 4.20 | 0.82 |
| | Position played | Pitcher | 16 | 1.47 | 0.26 | 6.41 | 2.22 |
| | | Hitter-Outfielder | 8 | 1.73 | 0.34 | 7.92 | 3.44 |
| | | Hitter- Infielder | 19 | 1.71 | 0.26 | 9.25 | 3.33 |
| | | Catcher | 15 | 1.44 | 0.25 | 5.73 | 1.84 |
| Total | Representative level | Local | 10 | 1.78 | 0.23 | 6.73 | 1.79 |
| | | State | 14 | 1.48 | 0.19 | 4.58 | 0.96 |
| | | Semi-professional/ Professional | 2 | 2.88 | 0.49 | 21.56 | 11.86 |
| | | Aust rep | 32 | 1.62 | 0.13 | 5.50 | 0.79 |
| | Position played | Pitcher | 16 | 1.93 | 0.21 | 8.71 | 0.74 |
| | | Hitter-Outfielder | 8 | 2.03 | 0.27 | 9.21 | 1.07 |
| | | Hitter- Infielder | 19 | 2.16 | 0.20 | 11.93 | 0.79 |
| | | Catcher | 15 | 1.63 | 0.20 | 5.90 | 0.63 |

N.B.: Covariates appearing in the model are evaluated at years spent playing = 28.02. This was the mean calculated from respondents who indicated injury, level of play and position.

Table 7: Results of significant posthoc tests (non adjusted).

| Injury Level | Factor | Significant Post Hoc Comparison | p |
|--------------|-----------------|---------------------------------|--------|
| Major | Position Played | Catcher vs Pitcher | 0.022* |
| | | Catcher vs Hitter-Outfielder | 0.042* |
| | | Catcher vs Hitter-Infielder | 0.004* |

* denotes significance at the $p < 0.05$ level.

54.7% (n=41) of respondents reported experiencing a total of 98 major injuries during their playing career (see table 8). With respect to frequency, 63.6% of respondents reporting an injury experienced no more than one major injury during their playing career while 27.3% experienced 2-3 and 9.1% experienced 4 or more. 77.3% (n=58) of respondents reported experiencing a total of 273 significant injuries during their playing career. With respect to frequency, 36.4% of respondents experienced no more than one significant injury, 33.3% experienced 2-3 and 30.3% experienced 4 or more significant injuries during their playing career. 83% of all injuries were sustained during play and 17% occurred during practice (see table 8).

Table 8: Total incidence of injury and severity during play and training as recalled by retired baseball players (n=66)

| Severity of injury | Sustained during a game | Sustained during practice | Category total |
|--------------------|-------------------------|---------------------------|----------------|
| Major | 89 (90.8) | 9 (9.2) | 98 (26.4) |
| Significant | 219 (80.2) | 54 (19.8) | 273 (73.6) |
| Total | 308 (83.0) | 63 (17.0) | 371 (100.0) |

N.B.: Figures in () are % of category total.

A total of 41 (54.7%) respondents required hospitalisation on a total of 66 separate occasions as a result of an injury sustained during their baseball career. This represented a mean for the group (n=41) of 3.5 (± 9.3) days in hospital with a range of 0-72 days reported by respondents. Injuries requiring a hospital visit ranged from out patient visits to monitor concussion, set fractured bones, receive treatment for lacerations to extended stays in hospital for a range of surgical procedures (e.g. cartilage tears requiring surgery, joint reconstruction surgery, etc.). 62.1% (n=41) of respondents spent one day or less in hospital having their injuries treated. 19.7% (n=13) spent between 2-3 days in hospital, 4.6% (n=3) spent 4-5 days in hospital and 13.6% (n=9) spent 6 days or more in hospital resulting from injuries sustained during their playing career. The respondent requiring a

72 day stay in hospital received major surgery to the knee in 1951. A total of 14 respondents indicated that they had undergone a total of 16 surgical procedures relating specifically to either joint replacement or joint reconstruction (see table 9). However, only 3 cases of joint replacement and 7 of joint reconstruction were deemed to have a medical link with the respondents involvement in baseball.

Table 9: Incidence of joint replacement/reconstruction reported by respondents (n=14).

| Surgical procedure | n |
|---------------------------------|---|
| Joint replacement - shoulder | 1 |
| Joint replacement - knee | 4 |
| Joint replacement - hip | 1 |
| Joint reconstruction - shoulder | 5 |
| Joint reconstruction - elbow | 2 |
| Joint reconstruction - knee | 3 |

N.B.: Respondents may have undergone more than one surgical procedure.

Respondents were asked to indicate if they were experiencing any of a number of listed medical conditions at the time of completing the survey. Table 10 provides a summary of these responses (n=74) and also indicates if medical examination had established if any of the listed conditions were directly related to the respondent's involvement in baseball. 40% and 47.4% of respondents indicated that they were currently experiencing arthritis and restricted joint mobility that was associated with their participation in baseball. Of those respondents suffering from arthritis the most common site of the disease was the knee followed by the fingers (see table 11). 55% of those indicating that they had arthritis in the knee indicated that medical examination had established that it was linked to their participation in baseball. In contrast just 20% of respondents experiencing

arthritis of the fingers had indicating that medical examination had established that this was due to their baseball participation.

Table 10: Incidence of medical conditions currently experienced by respondents and medically established link with baseball (n=74).

| Medical condition | n | Established medical link with baseball |
|---------------------------|----|--|
| Arthritis | 35 | 14 (40.0) |
| Chronic back pain | 17 | 3 (17.6) |
| Restricted joint mobility | 38 | 18 (47.4) |
| Poor eyesight | 11 | 0 (0.0) |
| Chronic headaches | 3 | 0 (0.0) |
| Dental problems | 6 | 1 (16.7) |
| Chronically stiff fingers | 10 | 3 (30.0) |

N.B.: Figures in () are % of condition total. Not all respondents answered this question. Respondents may have reported more than one of the listed conditions.

12% of respondents were taking medication for their arthritis at the time of the survey. However, only 44.4% (i.e. 4 of 9) of these had indicated that their arthritis was linked to playing baseball. In addition 18.7% of respondents were taking anti-inflammatory medication and 10.7% were taking analgesics.

13.3% of respondents indicated that the injuries sustained from participation in baseball had been compounded by their work. 26.7% indicated that other sport activities had exacerbated their injuries from baseball and 10.7% had suffered some form of accident which had made their injury worse. Further, 6.7% of respondents indicated that they were currently seeing a physiotherapist while 53.3% had sought physiotherapy treatment previously for injuries related to their playing career. 8% of respondents were currently

seeing a medical doctor and 5.3% were seeing a medical specialist for treatment related to injuries sustained during their playing career and a further 5.3% were seeking treatment from an alternative therapist (e.g. chiropractor).

60% of all respondents were covered by private health insurance throughout their entire baseball career, while the balance were either covered for some of the time or not at all. Just 8% of respondents indicated that their club always paid any medical costs incurred by them during their playing career.

Table 11: Site of arthritis in retired baseball players (n=31).

| Site of Arthritis | Total | Left | Right | Both |
|-------------------|-------|-------|-------|-------|
| Shoulder | 5 | 1 (1) | 3 (2) | 1 |
| Elbow | 3 | | 3 (2) | |
| Wrist | 3 | 1 | 1 | 1 |
| Fingers | 10 | | 2 (1) | 8 (1) |
| Hip | 3 | 1 (1) | | 2 |
| Knee | 20 | 6 (3) | 9 (6) | 5 (2) |
| Ankle | 2 | | | 2 |
| Toes | 2 | | | 2 |
| Back | 5 (1) | | | |
| Neck | 2 | | | |

N.B.: Figures in () represent the number of reported conditions of arthritis that medical examination established were linked to baseball. Respondents may have reported more than one site of this condition.

5.3 Impact of injuries

Respondents were asked to indicate if, in their opinion, the injuries sustained during their playing career had impacted negatively on them in some way either during or after their retirement from baseball. They were asked to select from a list of 5 “consequences” (see table 12). 29.3% of respondents indicated that they believed they had incurred additional medical cost associated with their injuries that were not covered by their health insurance or club cover. 28% had retired early from baseball as a result of their injuries and 26.7% felt that they were currently experiencing limitations in their ability to carry out normal recreational activities. However, only 12% perceived that they had significant loss of income due to extended periods of recovery and/or rehabilitation from their injuries and just 5.3% perceived that their injuries had impacted on their ability to perform work for which they had previously been trained.

Table 12: Perceived consequences of injuries sustained by respondents during or after retirement from baseball (N=75).

| Perceived consequence | No | Unsure | Yes |
|--|-----------|---------|-----------|
| Significant loss of income due to extended periods of recovery and/or rehabilitation. | 65 (86.7) | 0 | 9 (12.0) |
| Limitations with respect to job opportunities that you were previously trained for. | 69 (92.0) | 1 (1.3) | 4 (5.3) |
| Medical costs incurred by you that were not covered either by a health fund or club insurance. | 48 (64.0) | 4 (5.3) | 22 (29.3) |
| Limitations on current ability to carry out normal recreational activities e.g. walking, gardening, etc. | 50 (66.7) | 4 (5.3) | 20 (26.7) |
| Early retirement from baseball due to injury. | 50 (66.7) | 3 (4.0) | 21 (28.0) |

N.B.: Not all respondents answered this question. Figures in () are percentages.

5.4 Training and game preparation.

Respondents were asked a series of questions relating to their training and game preparation. These were related to warm-up and cool-down practices, the presence of

trained medical staff at games and practice, and their overall training habits during their playing careers.

85.3% and 74.7% of all respondents either “usually” or “always” participated in some form of active warm-up activity prior to playing a game or training respectively. 72% of respondents either “usually” or “always” participated in some form of active stretching activity prior to games and 69.3% indicated that they also “usually” or “always” stretched prior to training. However, the number of respondents who “usually” or “always” stretched after a game or training dropped to 26.7% and 29.3% respectively. The availability of medically trained assistants at games for the treatment and assessment of injuries is summarised in table 10. Medically trained assistants tended not to be available at club games or training but were more likely to be in attendance at representative games (see table 13).

80% of respondents trained 1-2 times per week with their club team while 9.3% trained 3 times or more. 44% of respondents also trained by themselves for an additional 1-2 sessions per week with 20% training 3 times or more. Of those respondents involved in representative team training 57.3% attended 1-2 sessions per week while a further 18.7% attended 3 or more sessions per week.

Table 13: The availability of medically trained assistants at games.

| Game type | Never | Occasionally | Most of the time | Always |
|-------------------------|-----------|--------------|------------------|-----------|
| Club games | 57 (76.0) | 13 (17.3) | 0 | 2 (2.7) |
| Club training | 62 (82.7) | 6 (8.0) | 1 (1.3) | 1 (1.3) |
| Representative games | 16 (21.3) | 18 (24.0) | 18 (24.0) | 13 (17.3) |
| Representative training | 29 (38.7) | 17 (22.7) | 11 (14.7) | 6 (8.0) |

N.B.: Not all respondents answered this question. Figures in () are percentages.

6.0 Discussion:

As with any research in which a sample from a larger population is studied, a number of limitations exist to this work. These are:

- i) The generalisability of the results. This research was conducted using a relatively small sample of retired players and therefore in order to apply these findings with some confidence to all retired players research using a larger sample is needed.
- ii) This research relied upon the recollection and honesty of respondents in completing the questionnaire. In some cases respondents were reporting details of injuries that may have occurred 50 years or more ago.
- iii) No attempt was made to control for total number of games played or total training exposure. It is possible that the number of games played and total training volume may impact on rate of injury and/or severity.
- iv) No attempt was made to balance the number of respondents playing at the 5 different levels of play identified within the survey. The level of representative play reported by respondents was skewed toward Australian representative level with almost 48% of all respondents playing at this level. In contrast less than 3% played professionally.

Very little published data on injury rates in baseball exist, which is surprising given the levels of participation in this sport globally. The data reported here does not appear to confirm claims of baseball having high rates of injury (Lachowetz et al. 1998; Mueller et al. 2001; Nicholls et al. 2004). However, the types of injuries found within the current sample of retired baseball players are similar to those reported previously in the literature (Burkhart et al. 2000; Plancher & Minnich 1996; Rettig 1998; Whiteside et al. 1999).

No research to date has examined the long-term consequences of injuries sustained by baseball players during their playing careers. Consistent with the original aims and objectives of this research this study has attempted to shed some light on this issue by

asking retired players to report the impact of the type and severity of injury on them up to 30 years or more after retiring from the game. Given the lack of research into long-term consequences of injury generally and the unique nature of each sport, not only in terms of skill but also playing and training demands, no attempt has been made to compare the results found here with those reported previously in rugby league (Meir et al. 1997; Weatherby et al. 1999b), cricket (Noble-Jerks et al. 2004) and soccer (Turner et al. 2000). Further, the following section will be restricted to the key findings of this research.

6.1 Injury severity and rate during playing career

Within the limitations of this study it can be concluded that rate and severity of injury is not linked to years playing or level of participation, although there was a trend toward higher rates of injury overall and incidence of major injury associated with participation in representative level play but this was not significant (see table 5). With respect to position played it was found that catchers were significantly less likely to sustain a major injury during their playing careers than all other playing positions. Just 14.7% of respondents to the survey indicated that injury alone was the primary reason for them retiring from participation in the sport with a further 25.3% indicating that a combination of age and injury was responsible for their retirement.

Given the average length of participation in this sport (27.2 ± 10.9 years) the average total frequency of injury (5.6 ± 7.1) among those respondents ($n=66$) reporting an injury could not be considered excessive. Further, the average rate of major and significant injuries, as defined within this study, would appear to also be relatively low within this group at just $1.5 (\pm 2.2)$ and $4.1 (\pm 6.5)$ respectively with the vast majority (83%) of both types of injury typically occurring during a game. However, it was noted by some respondents that their participation in other sport activities (26.7%), work (13.3%) or some form of accident (10.7%) may have made these injuries worse.

While some injuries required hospitalisation most of these were relatively minor and required only an out patient visit lasting less than 1 day. Notwithstanding this, some

respondents sustained an injury severe enough to ultimately require joint replacement (3 cases) or joint reconstruction (7 cases) surgery resulting in an extended stay in hospital.

6.2 Injury type, medical conditions and consequences linked to participation

According to Plancher and Minnich (1996) the key to preventing sport specific injuries is increasing the awareness among participants and sports physicians about the common injuries related to their sports in the hope that they will take additional precautions to reduce their risk of injury. This study has identified a total 47 different injuries occurring as a result of participation in baseball.

Injury rates and ranking based on reported frequency of occurrence by respondents are presented in table 14. The most frequent injuries reported by retired players are identified as ankle sprains, hamstring strain, rotator cuff injury of the shoulder, and tendon/ligament damage to the elbow or forearm. However, when combined, injury to the shoulder, elbow and forearm account for 12.4% of all injuries reported. This is not surprising given the high demand placed on throwing and pitching skills within this sport, which may result in injury to these areas of the arm and shoulder. However, as noted earlier the rates reported here are substantially lower than those reported previously for baseballers (Lachowetz et al. 1998).

Table 14: Rank order of injury according to frequency rate reported by respondents (n=66).

| Site of body | Type of injury | f | % |
|-------------------|---------------------------------------|----|-----|
| Ankle | Sprained ankle (ligament damage) | 22 | 9.1 |
| Hip and Thigh | Hamstring strain | 16 | 6.6 |
| Shoulder | Rotator cuff injury | 15 | 6.2 |
| Elbow and Forearm | Tendon or ligament damage | 15 | 6.2 |
| Knee | Cartilage tears that required surgery | 12 | 5.0 |
| Shoulder | Tendon or ligament damage | 11 | 4.5 |
| Hand | Fractured (broken) finger | 10 | 4.1 |

Table 14 continued over page...

Table 14 continued...

| Site of body | Type of injury | f | % |
|-------------------|--|---|-----|
| Groin | Muscular injuries | 9 | 3.7 |
| Head and facial | Concussion | 8 | 3.3 |
| Head and facial | Fractured (broken) nose | 8 | 3.3 |
| Hand | Finger dislocation | 8 | 3.3 |
| Neck | Muscular injuries | 6 | 2.5 |
| Back | Muscular injuries (lower back) | 6 | 2.5 |
| Knee | Medial Collateral Ligament (MCL) injury | 6 | 2.5 |
| Hip and Thigh | Other muscular injuries | 5 | 2.1 |
| Knee | Anterior Cruciate Ligament (ACL) injury | 5 | 2.1 |
| Ankle | Fractured (broken) ankle/shin bone | 5 | 2.1 |
| Head and facial | Eye Injury | 4 | 1.7 |
| Neck | Ligament damage | 4 | 1.7 |
| Shoulder | Muscular injury (shoulder or upper back) | 4 | 1.7 |
| Shoulder | Reconstructive surgery | 4 | 1.7 |
| Elbow and Forearm | Fractured (broken) wrist | 4 | 1.7 |
| Hand | Tendon or ligament damage | 4 | 1.7 |
| Chest/Abdomen | Abdominal strain injuries | 4 | 1.7 |
| Ankle | Muscular injuries | 4 | 1.7 |
| Back | Tendon or ligament damage | 3 | 1.2 |
| Shoulder | Shoulder dislocation | 3 | 1.2 |
| Shoulder | Nerve injury to shoulder or upper arm | 3 | 1.2 |
| Elbow and Forearm | Fractured (broken) forearm | 3 | 1.2 |
| Chest/Abdomen | Fractured (broken) ribs | 3 | 1.2 |
| Chest/Abdomen | Cartilage injury of ribs | 3 | 1.2 |
| Ankle | Tendon or ligament damage | 3 | 1.2 |
| Back | Fractured (broken) vertebra | 2 | 0.8 |
| Back | Muscular injuries (upper back) | 2 | 0.8 |
| Shoulder | Clavicle fracture | 2 | 0.8 |
| Elbow and Forearm | Nerve injury or entrapment | 2 | 0.8 |
| Knee | Posterior Cruciate Ligament (PCL) injury | 2 | 0.8 |
| Knee | Patella tendon injury | 2 | 0.8 |

Table 14 continued over page...

Table 14 continued...

| Site of body | Type of injury | f | % |
|-----------------|---|---|-----|
| Ankle | Fractured (broken) bones of the foot | 2 | 0.8 |
| Head and facial | Fractured (broken) jaw | 1 | 0.4 |
| Back | Disc injury of the lumbar or thoracic spine | 1 | 0.4 |
| Shoulder | Acromioclavicular (AC) joint dislocation or subluxation | 1 | 0.4 |
| Chest/Abdomen | Fractured (broken) sternum | 1 | 0.4 |
| Groin | Tendon injury | 1 | 0.4 |
| Hip and Thigh | Quadriceps strain | 1 | 0.4 |
| Hip and Thigh | Tendon or ligament damage | 1 | 0.4 |
| Knee | Reconstructive surgery | 1 | 0.4 |

The overhand throwing and pitching techniques of this sport place considerable and varied load upon the shoulder complex greatly contributing to soft tissue microtrauma, which includes such conditions as subacromial impingement, bicipital tendonitis, rotator cuff tendonitis, and partial tear or rupture of the supraspinatus, etc. (Jeran & Chetlin 2005). Injury susceptibility is highest to this area of the body in baseballers when throwing or pitching due to "...the rapid and forceful transition between the end of the cocking phase and the start of the acceleration phase" (Jeran & Chetlin 2005, p. 14). Yet it is possible that the injuries identified within this study may all be reduced with appropriate sport specific conditioning and prehabilitation exercises. For example, functional balance training on unstable surfaces may not only improve proprioception but also reduce the likelihood of injury to the ankle, knee and lower back (Ruiz 2005; Verhagen et al. 2004). Given the explosive and dynamic changes in direction associated with baseball some form of systematic conditioning of the ankle joint is warranted. Balance deteriorates with age and given that many respondents are still participating well into their middle age this form of training may become increasingly important. It is worth noting that athletes who suffer ankle sprains are also more likely to reinjure the same ankle (Verhagen et al. 2004).

Injuries to the shoulder in baseball are common (Brumitt 2005). However, while many players will undertake strength training programmes as part of their physical preparation often these exercises are inadequate to maintain shoulder health and maximise performance (Burmitt 2005; Jeran & Chetlin 2005). The rotator cuff consists of 4 muscles which all play an important role in elevating the shoulder, creating rotation about the shoulder and providing biomechanical control (Burmitt 2005). These muscles act both concentrically (during the cocking phase of pitching/throwing) and eccentrically (during the throwing phase and ball release) and should be trained using these forms of muscular action, which will not only improve performance but also reduce the risk of injury (Burmitt 2005; Wagner 2003).

It is reasonable to assume that the debilitating consequences of major injuries will worsen without appropriate medical care, potentially deteriorating with the number of years post retirement. Joint injuries are thought to produce long-lasting side effects, such as increased risk of osteoarthritis (OA), restricted joint movement and the possibility of joint replacement or reconstruction (Dorr 1991; Neyret et al. 1993; Seward et al. 1993). OA results in pain that can inhibit quality of life and possibly career options, while severe pain may lead to sufferers seeking joint replacement surgery. At present, vigorous physical activity cannot be pursued after such surgery (Dorr 1991), possibly limiting vocational options post this procedure.

Of those respondents experiencing arthritis and/or restricted joint mobility at the time of the survey 41.9% (n=13) and 50% (n=18) respectively indicated that medical examination had linked these conditions to their participation in baseball. The most common site of arthritis was the knee followed by the fingers possibly reflecting the stresses placed on these joints of the body from participation in this sport. However, only a small number (n=4) of respondents were taking medication for this condition. Further, within the sub-group of 13 who had indicated that their arthritis was linked to their baseball participation 7 were taking anti-inflammatory medication and 3 were taking analgesics, a rate which appears low.

The survey found that of the respondents suffering long-term complications, 12.0% (n=9) indicated that they had lost income during their career due to injury. While the majority of respondents were covered by private medical insurance throughout their career it is not clear whether they had any form of income protection or were paid sick leave in their normal employment when absent from work due to injury sustained while playing. Notwithstanding this, 9.3% of respondents indicated that they either “agreed” or “strongly agreed” that in their opinion the injuries identified as occurring during their playing career had affected their ability to work in their chosen career or generate income. Further, 5.3% (n=4) respondents indicated that, in their opinion, they had suffered a reduced ability to work in their chosen occupation because of the consequences of old injuries.

There is also the issue of ongoing medical costs incurred as a result of injury during a player's career. 29.3% (n=22) of respondents reported that they had to cover additional medical costs associated with these long-term injury complications that were not covered by their health insurance or club cover. In addition, 26.7% (n=20) perceived that their injuries had placed limitations on their ability to carry out normal recreation activities such as walking, gardening, etc. However, it may also be argued that because of their involvement in this sport their ability to participate in a range of physical activities later in life has been enhanced.

7.0 Recommendations:

Based on the findings from this research the following recommendations are made:

2. injury prevention strategies should be implemented in baseball and targeted generally across all players;
2. attention should be made to areas in which injuries most frequently occur e.g. the ankle, hamstrings and shoulder;
3. as in other sports arthritis, restricted joint mobility and chronically stiff fingers affect current lifestyle after retirement from participation. As a result prevention strategies should be developed to target these conditions;
4. further analysis is needed to establish the true cost of injury on the medical

system; and

5. given the relatively small sample participating in this current research further analysis is needed involving a larger sample before these results can be considered indicative of retired players in this sport.

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Appendix 1.0:

Survey cover letter

School of Exercise Science and Sport Management

Phone: 02 66 203767

Fax: 02 66 203880

2 May 2005

Dear past member of the Far North Coast Baseball Association

Re: an invitation to be involved in research involving retired baseball players

The FNC Baseball Association database has revealed your name as a retired player and as a result we would like to invite you to be involved in some important research being conducted by The School of Exercise Science and Sport Management at Southern Cross University, Lismore. The School has been successful in gaining a research grant from the NSW Sporting Injuries Committee to conduct research on injuries in baseball. Specifically this research will look into the long term effects of sports injuries on retired baseball players....so, as a former baseball player we are seeking your valuable input into this study.

As researchers we do not have access to the FNC Baseball Association membership database and therefore your personal details (e.g. age, playing record, etc.) have not been divulged to us. *If you are still playing baseball and have therefore been contacted by mistake please disregard this survey.*

Our School has conducted similar research in the sports of rugby league and cricket; however to the best of our knowledge, this is the first time this kind of study has been conducted in baseball anywhere in the world. It is hoped that the information gathered will add to the current body of knowledge regarding sports injuries, management of injuries and the long-term consequences of injuries on baseball players.

Your involvement in this project is totally voluntary you do not have to answer the questionnaire or return it. Should you agree to be involved your identity will remain anonymous at all times – no records are kept identifying who has been mailed a survey and the researchers will not know from whom the returned surveys have come. When reporting on the results of this study, no single individual will be able to be identified at any stage. Completed surveys will be kept in secure storage for 5 years following data analysis and then destroyed. This project has been granted approval by the University's Human Research Ethics Committee and is subject to the strict guidelines and controls as set down by the Committee for such research. There are no risks associated with your involvement in this study.

Enclosed is a copy of the questionnaire which forms the basis of our research. The questionnaire requires you to respond to a series of questions and will take approximately 15-20 minutes of your time to complete. Please read the instructions carefully and respond accordingly to each question - there are no "right" or "wrong" answers to any question. When you have answered all the questions, simply return the completed survey in the enclosed self addressed, reply paid envelope.

Continued over page...

It would be appreciated if you could return the completed form to the School by 20th May, 2005. The more replies we can get, the more reliable the results will be.

If you have any questions whatsoever about the survey, the evaluation, or the results please do not hesitate to contact either myself, or Associate Professor Robert Weatherby. Our contact details are provided below:

Rudi Meir Ph: 02 66203911 Email: rmeir@scu.edu.au
Robert Weatherby Ph: 02 66203671 Email: rweather@scu.edu.au

Baseball is a great sport and your participation in this study may help to ensure that continuing generations of players enjoy their sport in the years to come. Once the study and analysis is completed a report will be prepared and submitted to both the NSW Sporting Injuries Committee and the Australian Baseball Federation.

I trust you will consider consenting to be involved in this study, your input will be both valuable and greatly appreciated.

Sincerely



Rudi Meir – Co-researcher
Senior Lecturer

P.S. Please don't forget to complete and return the survey in the reply paid envelope (no stamp required) supplied by 20th May 2005.

Any complaints or queries regarding this project that cannot be answered by the person responsible for this research project should be forwarded to:

Mr. John Russell
Ethics Complaints Officer
Graduate Research College
Southern Cross University
P. O. Box 157
Lismore 2480

Tel: (02)66263705
Fax: (02)66269145
Email: jrussell@scu.edu.au

Encl.

Appendix 2.0:

Survey

N.B. the survey has been re-formatted to conform with the page set up of this document.

School of Exercise Science and Sport Management Southern Cross University

Survey of past sports injuries among retired baseball players

This questionnaire should take approximately 15-20 minutes. Please read the following questions carefully and complete as accurately as possible based on your memory and recollection. The majority of responses simply require you to “tick” the most appropriate answer in the space provided.

Personal Details:

1. What is your current age in years:

2. What was your age (in years) when you started playing as a registered baseball player in an organised competition (e.g. when you started playing club baseball as a junior or senior player):

3. What was your age (in years) when you stopped playing as a registered baseball player in an organised competition:

Playing History:

4. Have you played any form of representative baseball (tick appropriate box):

Yes

No

If answering “yes” to the above please indicate in the space below the highest level of representative baseball you achieved:

Local association representative team

State representation (e.g. Claxton Shield, Country, etc.)

Semi-professional/professional player

Australian representation

Other (Please indicate below):

5. During your baseball playing career, did you consider yourself to be mainly a (please tick one position):

| | |
|---------------------------|--------------------------|
| Pitcher | <input type="checkbox"/> |
| Hitter - Outfield fielder | <input type="checkbox"/> |
| Hitter - Infield fielder | <input type="checkbox"/> |
| Catcher | <input type="checkbox"/> |

6. Are you mainly left or right handed for the following activities (please tick appropriate box/es):

| | Left | Right |
|-----------------|--------------------------|--------------------------|
| Hitting/Batting | <input type="checkbox"/> | <input type="checkbox"/> |
| Pitching | <input type="checkbox"/> | <input type="checkbox"/> |
| Throwing | <input type="checkbox"/> | <input type="checkbox"/> |

7. If retired from competitive baseball, please indicate which of the following best explains why you no longer play (please tick appropriate box):

| | |
|-------------------------------|--------------------------|
| Injury | <input type="checkbox"/> |
| Age | <input type="checkbox"/> |
| Combination of age and injury | <input type="checkbox"/> |
| Time constraints | <input type="checkbox"/> |
| Work/Family commitments | <input type="checkbox"/> |
| Lack of interest / motivation | <input type="checkbox"/> |

Other (please state below):

Employment History:

8. Which of the following best describes your employment status for the majority of your baseball playing career (please tick the most appropriate box):

Full - Time

Part -Time

Unemployed

Student

9. If you indicated you were mainly employed on a full-time or part-time basis in Question 8 (above), which of the following best describes the type of job you held for most of the time during your baseball playing career (please tick the single most appropriate box):

Trades (e.g. plumber, brick layer, etc)

Labouring (e.g. building industry, council, etc)

Office (e.g. clerk, accountant, administration)

Teaching (e.g. schools, TAFE, university)

Sports related (e.g. development, coaching)

Own business (industrial, manufacturing)

Own business (retail, commercial)

Agricultural or Horticultural (e.g. farming)

Other (list in space below):

10. Which of the following best describes the type of job held for **most of the time since your retirement from playing baseball?** (please tick the single most appropriate box).

| | |
|---|--------------------------|
| Trades (e.g. plumber, bricklayer, etc.) | <input type="checkbox"/> |
| Labouring (e.g. building industry, council, etc.) | <input type="checkbox"/> |
| Office (e.g. clerk, accountant, administration) | <input type="checkbox"/> |
| Teaching (e.g. schools, TAFE, university) | <input type="checkbox"/> |
| Sports related (e.g. development, coaching) | <input type="checkbox"/> |
| Own business (industrial, manufacturing) | <input type="checkbox"/> |
| Own business (retail, commercial) | <input type="checkbox"/> |
| Agricultural or Horticultural (e.g. farming) | <input type="checkbox"/> |
| Retired | <input type="checkbox"/> |

Other (list in space below):

Medical History: please read the following carefully

11. Based on your best recollection, please use the table on the next 3 pages to indicate:

- **Column 1** - Did you suffer a **major injury** (i.e. more than 5 consecutive weeks of training/playing missed due to injury) involving baseball during your career? If so indicate the actual number of incidences (e.g. 1, 2,etc.) of each injury in the appropriate space in the following table.
- **Column 2** - If you suffered a **significant injury** (i.e. more than 1 week, but less than 5 weeks of training/playing missed due to injury) involving baseball during your career? If so indicate the actual number of incidences (e.g. 1, 2,etc.) of each injury in the appropriate space in the following table.
- **Column 3 & 4** - Did these injuries occur either during a game or during practice? Please indicate for each major and significant injury sustained in the appropriate space in the following table.

| Site and Type of Injury | Column number | | | | | |
|---|---|--|--------------------------------|----------|--------------------------------------|----------|
| | 1 | 2 | 3 | | 4 | |
| | Major injury, <u>more</u> than 5 weeks missed | Significant injury, more than 1 week but <u>less</u> than 5 weeks missed | Major injury sustained during: | | Significant injury sustained during: | |
| | | | Game | Practice | Game | Practice |
| Head and Facial | | | | | | |
| Concussion | | | | | | |
| Fractured (broken) nose | | | | | | |
| Fractured (broken) cheekbone | | | | | | |
| Fractured (broken) jaw | | | | | | |
| Eye Injury | | | | | | |
| Neck: | | | | | | |
| Cervical spine fracture (break) | | | | | | |
| Muscular injuries | | | | | | |
| Spinal cord injury | | | | | | |
| Ligament damage | | | | | | |
| Back: | | | | | | |
| Fractured (broken) vertebra | | | | | | |
| Muscular injuries (upper back) | | | | | | |
| Muscular injuries (lower back) | | | | | | |
| Disc injury of the lumbar or thoracic spine | | | | | | |
| Joint (facet) injury of the lumbar or thoracic spine | | | | | | |
| Tendon or ligament damage | | | | | | |
| Shoulder: | | | | | | |
| Shoulder dislocation | | | | | | |
| Acromioclavicular (AC) joint dislocation or subluxation | | | | | | |
| Clavicle fracture | | | | | | |
| Rotator cuff injury | | | | | | |
| Muscular injury (shoulder or upper back) | | | | | | |
| Tendon or ligament damage | | | | | | |
| Nerve injury to shoulder or upper arm | | | | | | |
| Reconstructive surgery | | | | | | |

Table continues over page...

Question 11 continued...

Column number

| Site and Type of Injury | 1 Major injury <u>more</u> than 5 weeks missed | 2 Significant injury, more than 1 week but <u>less</u> than 5 weeks missed | 3 | | 4 | |
|---------------------------------------|---|---|--------------------------------|----------|--------------------------------------|----------|
| | | | Major injury sustained during: | | Significant injury sustained during: | |
| | | | Game | Practice | Game | Practice |
| Elbow and Forearm: | | | | | | |
| Elbow dislocation | | | | | | |
| Fractured (broken) forearm | | | | | | |
| Fractured (broken) wrist | | | | | | |
| Nerve injury or entrapment | | | | | | |
| Tendon or ligament damage | | | | | | |
| Hand: | | | | | | |
| Finger dislocation | | | | | | |
| Fractured (broken) finger | | | | | | |
| Tendon or ligament damage | | | | | | |
| Chest/Abdomen: | | | | | | |
| Fractured (broken) ribs | | | | | | |
| Punctured (collapsed) lung | | | | | | |
| Fractured (broken) sternum | | | | | | |
| Cartilage injury of ribs | | | | | | |
| Abdominal strain injuries | | | | | | |
| Groin: | | | | | | |
| Muscular injuries | | | | | | |
| Muscular injuries (requiring surgery) | | | | | | |
| Tendon injury | | | | | | |
| Hip and Thigh: | | | | | | |
| Hip dislocation | | | | | | |
| Fractured (broken) femur (thigh bone) | | | | | | |
| Quadriceps strain | | | | | | |
| Hamstring strain | | | | | | |
| Other muscular injuries | | | | | | |
| Tendon or ligament damage | | | | | | |
| Reconstructive surgery of the hip | | | | | | |

Table continues over page...

Question 11 continued...

Column number

| Site and Type of Injury | 1 Major injury <u>more</u> than 5 weeks missed | 2 Significant injury, more than 1 week but <u>less</u> than 5 weeks missed | 3 | | 4 | |
|--|---|---|--------------------------------|----------|--------------------------------------|----------|
| | | | Major injury sustained during: | | Significant injury sustained during: | |
| | | | Game | Practice | Game | Practice |
| Knee: | | | | | | |
| Cartilage tears that required surgery | | | | | | |
| Anterior Cruciate Ligament (ACL) injury | | | | | | |
| Posterior Cruciate Ligament (PCL) injury | | | | | | |
| Medial Collateral Ligament (MCL) injury | | | | | | |
| Patella tendon injury | | | | | | |
| Reconstructive surgery | | | | | | |
| Ankle: | | | | | | |
| Sprained ankle (ligament damage) | | | | | | |
| Fractured (broken) ankle / shin bone | | | | | | |
| Ruptured achilles tendon | | | | | | |
| Tendon or ligament damage | | | | | | |
| Muscular injuries | | | | | | |
| Foot: | | | | | | |
| Fractured (broken) toes | | | | | | |
| Fractured (broken) bones of the foot | | | | | | |

Question 12 over page...



12. Were you taken to hospital for any of your major or significant injuries identified in the preceding table? (tick appropriate box)

Yes No If **‘No’** go to question 13

If answering **‘Yes’** please indicate below the site and type of injury, as indicated in the preceding table, that required you to go to hospital and the number (e.g. 1, 2, ..., etc.) of days spent in hospital for each injury:

| | | |
|----|--|---|
| 1. | | <input type="checkbox"/> Days in hospital |
| 2. | | <input type="checkbox"/> Days in hospital |
| 3. | | <input type="checkbox"/> Days in hospital |
| 4. | | <input type="checkbox"/> Days in hospital |

13. Do you currently experience any of the following conditions? (tick appropriate box/es)

| | YES | NO |
|---|--------------------------|--------------------------|
| Arthritis | <input type="checkbox"/> | <input type="checkbox"/> |
| Chronic back pain | <input type="checkbox"/> | <input type="checkbox"/> |
| Restricted joint mobility (joint stiffness) | <input type="checkbox"/> | <input type="checkbox"/> |
| Problems with vision (poor eyesight) | <input type="checkbox"/> | <input type="checkbox"/> |
| Chronic headaches | <input type="checkbox"/> | <input type="checkbox"/> |
| Dental problems | <input type="checkbox"/> | <input type="checkbox"/> |
| Chronically stiff fingers | <input type="checkbox"/> | <input type="checkbox"/> |

Question 14 over page...

14. Have you undergone any of the following surgical procedures?

| | YES | NO |
|----------------------|-----|----|
| Joint replacement | | |
| Joint reconstruction | | |
| Surgery to the spine | | |

If answering “No” to all of the above please go to question 15.

If answering “Yes” to any of the above please indicate the site and location of this procedure in the appropriate space below:

| Joint Replacement (tick appropriate box/es) | Left | Right | Both |
|---|------|-------|------|
| Shoulder | | | |
| Elbow | | | |
| Knee | | | |
| Hip | | | |

| Joint Reconstruction (tick appropriate box/es) | Left | Right | Both |
|--|------|-------|------|
| Shoulder | | | |
| Elbow | | | |
| Knee | | | |
| Hip | | | |

Surgery to the Spine **IF** undergoing surgery to the spine please **briefly** describe the nature of your spinal surgery – e.g. “I had surgery on a bulging disc in my lumbar spine.”

Question 15 over page...



15. If you answered “Yes” to any of the above in questions 13 and/or 14 please consider and respond to the following:

- Has **medical examination** established that any of the following are a **direct consequence** of injuries sustained as **a result of your playing baseball**, please tick the appropriate box/es in **column 1**.
- If you have no medical proof that the condition is directly related to your involvement in baseball, but **you think** it has been **caused through baseball**, please tick appropriate box/es in **column 2**.
- If you are or have experienced any of the following, but it **is not** linked in any way to baseball, please tick appropriate box/es in **column 3**.

| | Column 1 Established medical link to baseball | Column 2 No direct medical link to baseball | Column 3 Not related to baseball |
|---|--|--|--|
| Arthritis | | | |
| Joint replacement | | | |
| Joint reconstruction | | | |
| Chronic back pain | | | |
| Restricted joint mobility (joint stiffness) | | | |
| Problems with vision (poor eyesight) | | | |
| Chronic headaches | | | |
| Surgery to the spine | | | |
| Dental problems | | | |
| Chronically stiff fingers | | | |

Other (please specify):

Question 16 over page...

16. If you indicated that you have previously had or are currently experiencing arthritis in Question 13, please provide details of **where** your condition was/is found (please tick the appropriate box/es):

| Arthritis | Left | Right | Both |
|------------------|-------------|--------------|-------------|
| Shoulder | | | |
| Elbow | | | |
| Wrist | | | |
| Fingers | | | |
| Hip | | | |
| Knee | | | |
| Ankle | | | |
| Toes | | | |
| Back | | | |

Other (please specify below):

17. Are you currently, or have you previously, taken or been prescribed with any of the following medications as a consequence of your baseball injuries? (please tick the appropriate box/es):

| | Yes Currently | Yes Previously | Never |
|------------------------------|--------------------------|---------------------------|--------------|
| Arthritis medication | | | |
| Anti inflammatory medication | | | |
| Analgesics (pain killers) | | | |

Other (please specify below):

Question 18 over page...

18. Have you consulted any of the following practitioners for treatment relating specifically to your baseball injuries? (please tick appropriate box/es):

| | Yes Currently | Yes Previously | Never |
|--|------------------|-------------------|-------|
| Physiotherapist | | | |
| Medical doctor | | | |
| Medical specialist | | | |
| Alternate therapist (i.e. chiropractor, naturopath) | | | |

Other, please indicate below

19. Have injuries in any of the following areas possibly compounded (made worse) injuries indicated in question 11 (please tick the appropriate box/es):

| | Yes | No |
|----------------------------------|-----|----|
| Work | | |
| Other sporting activities | | |
| Accidents (Non baseball related) | | |

Other, please indicate below

20. During your baseball playing career, did you have private health insurance or did your Club insure you against injury costs? (please tick appropriate box):

| | Yes - Always | No - Never | More than half the time | Less than half the time |
|-----------------------------|--------------|------------|----------------------------|----------------------------|
| Private health Insurance | | | | |
| Club paid for medical costs | | | | |

21. Do you currently have (please tick appropriate box/es):

| | Yes | No |
|--|-----|----|
| Private Health Insurance (Hospital cover only) | | |
| Private Health Insurance (Hospital cover + extras including Physiotherapy) | | |

Impact of Injuries:

22. If you identified injuries through baseball (in question 11), have any of the consequences of these injuries affected you in any of the following ways (please tick appropriate box/es):

| | No | Unsure | Yes |
|--|----|--------|-----|
| Significant loss of income due to extended periods of recovery and/or rehabilitation | | | |
| Limitations with respect to job opportunities (i.e. unable to do work that you were <u>previously trained for</u>) | | | |
| Medical costs incurred by you that were not covered either by a Health Fund or club insurance | | | |
| Limitations on your current ability to carry out normal recreational activities (e.g. walking, gardening, fishing, etc.) | | | |
| Did injury result in early retirement from baseball | | | |
| Other (please specify) | | | |

23. In your opinion, do you feel that the injuries identified previously (in question 11 & 15) have in any way affected your ability to work in your chosen profession or generate income (please tick the most appropriate box):

| Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|-------------------|----------|-----------|-------|----------------|
| | | | | |

Training and Game Preparation:

24. During the period that you played baseball, were you encouraged to take part in active warm-up activities before games and training e.g. light jogging (please tick most appropriate box):

| | Never | Very Rarely | Occasionally | Usually | Always |
|-----------------|-------|-------------|--------------|---------|--------|
| Before games | | | | | |
| Before training | | | | | |

25. During the period that you played baseball, were you encouraged to take part in active stretching before or after games and training (please tick most appropriate box):

| | Never | Very Rarely | Occasionally | Usually | Always |
|-----------------|-------|-------------|--------------|---------|--------|
| Before games | | | | | |
| Before training | | | | | |
| After games | | | | | |
| After training | | | | | |

26. During your baseball playing career, were there medically trained assistants (e.g. Doctor/Physiotherapist) available to treat and assess injuries at the following times (please tick most appropriate box/es):

| | Never | Occasionally | Most of the time | Always |
|-------------------------|-------|--------------|------------------|--------|
| Club games | | | | |
| Club training | | | | |
| Representative games | | | | |
| Representative training | | | | |

27. During your baseball playing career, a) how many times a week, on average, did you train with a team (please include both club and representative commitments), and b) by yourself during the season (please tick most appropriate boxes):

| a) How many times training with team / s | | | | | b) How many times training by yourself | | | |
|--|------------|-----------------------|-----------------------|-------------------------------|--|-----------------------|-----------------------|-------------------------------|
| | Not at All | 1-2 Sessions per week | 3-4 sessions per week | More than 5 sessions per week | Not at All | 1-2 Sessions per week | 3-4 sessions per week | More than 5 sessions per week |
| Club | | | | | | | | |
| Rep. | | | | | | | | |

Thank you for taking the time to complete this survey. It is very much appreciated.

Please ensure you return your completed survey in the reply paid envelope provided by Wednesday 8th June 2005.

If you have any queries about this survey please don't hesitate to contact:

Mr. Rudi Meir Ph: 02 66203911
Associate Professor Robert Weatherby Ph: 02 66203671

Email: rmeir@scu.edu.au
Email: rweather@scu.edu.au