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RISK EVALUATION IN PROFESSIONAL FOOTBALL

BY

SCOTT DRAWER

A DOCTORAL THESIS

Submitted in partial fulfilment of the requirements for the award of Ph.D. of Loughborough University

OCTOBER 2001

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ABSTRACT

Risk management is composed of three major elements viz., hazard identification, risk estimation and risk evaluation. The aim of hazard identification and risk estimation is to identify the outcomes from risk, the magnitude of the associated consequences from risk, and the estimation of the probabilities of these outcomes. Previous work focused on hazard identification and risk estimation and identified the relatively high risks associated with playing professional football. By adhering to the risk management process, the aim of this thesis was to determine the significance of these high risks to football clubs and their players.

A theoretical framework was designed to evaluate the influence of player injury on the financial and playing performance of professional football clubs. This framework was also used to assess, through use of cost benefit analysis, the practicalities of investing in suitable injury prevention strategies, to reduce the risks to football clubs and their players. Former professional footballers were surveyed to investigate the long-term medical and socio-economic consequences associated with the high risks of playing professional football.

The results identified the high financial costs associated with player injury on professional football clubs. Although the high risks of player injury have a relatively minor effect on team-performance of the Premier League clubs, this effect still has a relatively major influence on the financial performance of the club. In contrast, the influence of player injury to team-performance was relatively major for Division 1 and Division 2 clubs, but this had a relatively minor effect on financial performance. The application of cost benefit analysis to the investment of specialist personnel to reduce the risks of injury demonstrated that the proposals were practicable for Premier League and Division 1 clubs only. In addition, it was also demonstrated that the high risks associated with playing professional football have a significant influence on the long-term well-being of former players. One-third of former players had been medically diagnosed osteoarthritic in a lower limb joint. The majority of players also perceived that injury had a negative influence on their present and future welfare.

The results demonstrate that the consequences associated with the relatively high acute injury risk also have a significant effect on the financial and playing performance of football clubs and the future welfare of their players.

Keywords: Risk evaluation, professional football, cost benefit analysis, injury prevention.
I would like to thank the following people for their assistance in the completion of this project:

Dr. Colin Fuller for his guidance, support and advice throughout the doctoral project without which none of this work would have been possible. To think that the research work has reached the highest echelons of the sport in only six years, being recognised by the F.A, P.F.A and F.I.F.A, is a reflection of the vision, direction and guidance provided by Dr. Fuller.

I would also like to thank the professional football club physiotherapists and former players who provided responses to the survey work and the organisations that provided insights into aspects of the professional football industry. I would like to extend specific gratitude to Jim Walker of Aston Villa F.C. for his valuable insights into the professional football industry.
Unless otherwise indicated by acknowledgements or references to published literature, the work contained herein is that of the author. The findings presented in this thesis have been reported, in part, in the following publications.

**Journal articles:**


**Communication:**

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Association football (soccer) was estimated to have generated $200Bn in economic activity across the world in 1997 (Harverson, 1997a). In the UK alone, the Premier League has grossed £2.15Bn since its formation in 1992/93 (Boon et al, 1999a). The developments in the English football industry have been partly due to the increase in broadcasting coverage and financial income from the British Sky Broadcasting Company (BSkyB). Under the current agreement, which is set to expire in 2001, Premier League clubs received £743M over four years from BSkyB and the BBC in return for broadcasting rights (Mason, 1999). The new agreement with satellite television, which is set to start in 2001 will provide £1.5Bn over a four year period (Thal Larsen and Ward, 2000). The money from broadcasting is distributed amongst league clubs according to the number of television appearances and final league position of each club. Therefore, the teams that finish higher in the Premier League receive the greater broadcasting income (Baimbridge et al, 1996; Boon et al, 1999a).

This substantial cash income through the selling of broadcasting rights has provided the impetus for many professional clubs to float on the London Stock Exchange and the Alternative Investment Market (AIM). With investors purchasing stocks in the football industry to obtain a financial return, football clubs have become more professional enterprises, to ensure their investors are happy with the functioning of the business and their financial returns. Financial consultants, which operate within professional football, firmly believe that clubs cannot be excused their financial and business accountabilities when they receive such vast income from sponsors and broadcasters (Boon et al, 1999a). At the current time however, football stocks have failed to produce the returns expected of them due to the high and unrealistic assumptions of future profit growths from pay-per-view television and poor performances on the playing field by many of the clubs (Harverson, 1997a). More recently, the decision of the Monopolies and Mergers Commission (MMC) to block the take-over of Manchester United led to a 32.5p fall in share price to 186p and cast a cloud over the shares of other football clubs (Clark, 1999).

The huge investment by satellite television in professional football and the highly publicised changes in player contract law through the Bosman ruling (Blanpain and Inston, 1996; Whitehead, 1998) had their greatest impact on the players. In the English leagues, salaries
have increased on average 24% (13% – 36%) every year from 1993/94 to 1997/98 (Barton et al, 1997; 1998; Boon et al, 1995; 1999a; Thorpe et al, 1996). Players’ salaries accounted for 59% of turnover throughout the English Leagues during the playing season 1997/98 (Boon et al, 1999a). Despite this huge investment in professional footballers, players are absent from play due to injury for one month of the year (9.5% of total playing and training time) (Hawkins and Fuller, 1999). When a club faces a reduction in availability of their playing talent due to injury there are likely to be playing and financial consequences for the football club. The management of the players’ health and safety should therefore be of high priority.

Within UK industry the management of health and safety of employees is approached using risk management principles. The risk management process leads to a quantification of the injury risks and the consequences of the outcomes from these risks (Royal Society, 1992). The use of this process allows management to direct resources to the reduction of accidents within the company and to help improve the efficiency and effectiveness of the company’s operation. The novel use of risk management within professional football was first advocated by Fuller (1995), who outlined the implications of health and safety legislation within the UK to the professional sports-person. The application of the risk management process has since led to a detailed assessment of injury risk within professional football (Hawkins and Fuller, 1996, 1998a, 1998b, 1999). With a detailed database of injury data now available, the next logical process is to evaluate the consequences of the injuries to professional football. This process forms an essential tool in the risk prevention, treatment and recovery processes within professional football.

1.1.1 Background to the study

Previous work by Hawkins and Fuller (1996, 1998a, 1998b, 1999) has resulted in a detailed risk assessment of injury within professional football. The major findings of this work have shown that:

- The major causes of injury in international football matches were not associated with foul play as judged by referees. Where injuries occurred without a foul being committed, almost 50% involved player to player contact (Hawkins and Fuller, 1996).
- The large number of underlying ‘non-injury’ incidents in competitive matches is the reason for the high injury rate in professional football (Hawkins and Fuller, 1998a).
Chapter I: Introduction

- English professional players are deficient in their awareness of appropriate injury prevention strategies including use of shin pads during training, appropriate nutritional strategies, cool downs and flexibility programmes (Hawkins and Fuller, 1998b).
- Thirty-one percent of English league players will miss at least one competitive match during the season due to injury (Hawkins and Fuller, 1999).
- Muscle strains (41%), ligament sprains (20%) and contusions (20%) accounted for the majority of recorded injuries (Hawkins and Fuller, 1999).
- The risk of injury in professional football is 1000 times greater than other perceived high-risk industries, e.g., construction and mining (Hawkins and Fuller, 1999).

There is a dearth of other sources of risk assessment data within UK based professional football epidemiological studies (Lewin, 1989; McGregor and Rae, 1996). However, this has recently been recognised by the football authorities. The work carried out by Hawkins and Fuller has been replicated in a larger scale project being established at the Football Association (F.A.) Medical Centre, Lilleshall. This project, sponsored by the Professional Footballers' Association (P.F.A.), will provide the largest scale injury audit ever recorded within the world. The results should allow leading football organisations in England to respond to the major risk factors of players’ injuries. A similar project has recently been established within Europe by the Union of European Football Associations (U.E.F.A) and on a world scale, by the Federation of International Football Associations (F.I.F.A).

Professional football clubs now have sufficient data to make management investment decisions on the introduction of risk control measures within the workplace. Unfortunately, the strongest motivator for organisations to improve health and safety management, has been identified as the fear that adverse publicity, loss of confidence or regulatory attention following a serious incident will affect operations and impose additional costs (Wright, 1998). The civil claim for compensation brought by Michael Watson against the British Boxing Board of Control (B.B.B.C) (Foster, 1999) is therefore likely to be a watershed in terms of actions to improve standards in the provision of medical support facilities, both in boxing and in other sports. The Centre for Research into Sport and Society (CRSS) at the University of Leicester, in conjunction with the P.F.A., recently produced a report on the management of injuries in professional football (Waddington et al, 1999). The report led to nineteen recommendations to improve the procedures for appointments of club doctors and physiotherapists and for the provision of further training and education of club doctors. In addition, the report provided recommendations for investment in medical care, on players’ rights, and for establishing good practice. At a similar time, the F.A. have introduced new
guidelines to protect footballers from long-term physical damage whilst playing when injured (Hawkey, 2000).

For changes to occur within the football environment it is essential that additional regulation, established either through government or the F.A., is imposed on football clubs. There already exists external regulation through the Management of Health and Safety at Work (MHSW) Regulations (1992), but these Regulations are not currently implemented within professional football to an extent that may lead to an improvement in players’ health and safety. Internal regulation is unlikely to occur on a time scale that will also be effective enough to lead to the introduction of appropriate risk control measures. An alternative approach is to identify the social and economic costs of injury to the football industry because changes in the football industry have made finance an increasingly important factor, as clubs attempt to reward their stakeholders, pay players’ salaries, and provide success for their supporters. Senior management within football clubs should be able to relate to the financial consequences of failing to manage players’ health and safety through losses in team-performance, club-turnover and legal costs.

There have been a number of examples of poor playing performance influencing financial performance on the stock market (Beugge, 1997; Harverson, 1997b; Tucker, 1998; Heaves, 1999). In addition, there are examples of academic studies, which illustrate the relationship between performance and revenue (Syzmanski and Smith, 1997; Dobson and Goddard, 1998a; 1998b). However, there is currently no evidence or appropriate model to demonstrate the potential influence that players’ injuries and consequential absence may have on the playing and financial performance of professional football clubs. In addition to the employer (club) facing consequences of injury risk, the employees (players), and the society in which the club operates (supporters and community) are also likely to experience a variety of consequences from the failure to control injury risk. This process of injury impact identification and significance forms a major part of the risk management process.

The main aim of this thesis is to assess the impact and consequences that injuries have on both professional football clubs and their players. To assess the consequences of players’ injuries using the processes of risk management however, it is necessary to understand the meaning of risk, concepts that describe risk, and the processes behind competent risk management.
1.2 RISK

1.2.1 Definitions

There is no common, accepted definition of risk primarily due to the contrasting paradigms that have been used to explain the concept of risk and risk management. Within the UK however, the Health and Safety Executive (HSE) (1995) has produced a generic document to provide a standard workable definition of risk. This definition states that risk is:

‘...the chance of something adverse happening’ (p.7)

Within this definition, ‘chance’ refers to probability; ‘thing’ refers to a particular consequence, which might be more or less severe and ‘adverse’, since chance by itself may refer to a desired event (HSE, 1995). The Royal Society (1992), which has also offered a generic definition, states that risk is:

‘The probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge.’ (p.2)

The Royal Society’s (1983; 1992) definition of risk, has been adopted in this thesis as it includes a measure of the exposure period during which an adverse event might occur. In the collection of sport risk data, it is important to take into consideration the participation exposure because it will influence the risk of injury (Finch, 1997). It is also important to use exposure data to analyse the duration and seriousness of the sports injury and to enable an assessment of the sports incidence injury rate and the sports injury prevalence (van Mechelen, 1997). In addition to the definition of risk, the Royal Society provides a definition of the parameters describing the consequences of an adverse event, which is expressed as harm measured through loss for a human being (or human population). The numerical measure of the loss associated with the adverse event is termed detriment (Royal Society, 1983; 1992).

Risk management is the making of decisions concerning risks, from the procedures of risk estimation to risk evaluation and their subsequent implementation. Risk estimation covers the identification of outcomes from risk, the estimation of the magnitude of the associated consequences of these outcomes and the estimation of the probabilities of these outcomes. Risk evaluation is the complex process of determining the significance or value of the identified hazards and the estimated risks to those concerned with or affected by the decision (Royal Society, 1992). The processes behind risk management (hazard identification, risk
analysis, risk criteria, risk acceptability) enable decisions to be made to accept a known or assessed risk and / or the implementation of actions to reduce the consequences or probability of occurrence (Royal Society, 1992). The HSE (1995) has also proposed a meaning of risk management but has attempted to make the definition more workable and applicable to industry by providing a purpose for the processes inherent within risk management. This definition states that risk management:

'...involves applying a set of measures relevant to a particular set of significant risks with the intention of restricting and maintaining risks [within tolerable limits at proportionate cost]'. (p.38)

The aim of risk management in this context is to reduce the risks but within cost constraints of the organisation. Fuller (1998) has suggested that this contradicts later publications by the HSE (1997) which state that:

'The ultimate goal is an organisation aiming to improve its health and safety performance, so that accidents and ill – health are eliminated'.(p.7)

An environment of zero risk however, is both unattainable and undesired. In the pursuit of zero risk, freedom and nature are sacrificed leaving no scope for independent volition (Adams, 1995). In the majority of industries this is an impracticable objective because the investment required in achieving the goal of zero risk would seriously influence the profitability of the organisation (Fuller, 1998).

1.2.2. The process of risk management

The scope of risk management is extensive, covering both pure and speculative risk topics. The pure risk topics include occupational health and safety, fire, security, environment, quality, information technology reliability, business interruption, and the occurrence of natural disasters. Speculative risk topics include financial or credit risks, investments, business risks, political risks, social and cultural risks, human resources and both marketing and information technology strategy (Waring and Glendon, 1998). In many instances, pure and speculative risks interact and both should be considered during the process of risk management. It has been suggested that some standards have failed to recognise this fact by considering pure risks only (Waring and Glendon, 1998).
Figure 1.1 outlines the important processes inherent in risk management as proposed by AS / NZS (1995). In this instance, risk management is seen as a multi-faceted, iterative process, appropriate aspects of which are often best carried out by a multi-disciplinary team. Waring and Glendon (1998) who criticised the AS / NZS (1995) standards for its applicability to pure risk topics only, provide their own model to explain the scope of risk management. They identify the process of risk management to include hazard / threat identification, risk analysis and assessment (covering risk estimation, risk evaluation and risk decisions) and risk strategies. For speculative risks, the analysis should also include the potential positive or beneficial outcomes from the risk process. The logical procedures and content behind a risk management exercise are therefore similar for pure or speculative risks and should be applied in the sequence outlined in Figure 1.1.
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ESTABLISH THE CONTEXT
  e.g. the strategic context, the organisational context, the risk management context

Develop criteria

Decide the structure

IDENTIFY RISKS
  What can happen? How can it happen?

ANALYSE RISKS
  Determine existing controls
    Determine likelihood
    Determine consequences
    Establish level of risk

ASSESS RISK
  Compare against criteria, set risk priorities

TREAT RISK
  Identify treatment options
  Evaluate treatment options
  Prepare treatment plans
  Implement plan

Figure 1.1. Risk management process (Redrawn from AS / NZS, 1995)
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The risk management process should be undertaken with full consideration of the need to balance costs, benefits and opportunities (AS / NZS, 1995). Within the UK, this concept is expressed through the principle that risks must be reduced to as low a level as is reasonably practicable (ALARP). In this process, the cost and difficulty of applying risk control measures are assessed against the benefits obtained from risk reduction (Ball, 1997). This concept has been defined in the law courts, where it has been interpreted to mean that an action is not reasonably practical when the improvement it brings involves costs which are seriously out of proportion to the benefits achieved by the reduction in risk (Royal Society, 1983). All risk experts have not advocated this principle. In the U.S. where risk assessment is predominantly used in the health sector, Paustenbach (1995) suggested that adhering to the ALARP principle was a costly procedure and may not result in an appreciable benefit to society.

In the process of establishing the context of risk management, consideration must be given to the environment in terms of the financial, operational, competitive, political, social, client, cultural and legal aspects of the organisation's functions. The goals and objectives of the organisation will influence the process of risk management because failure to achieve such objectives can be classified as a risk in itself. The organisational policies will also help define whether a risk is acceptable and whether the proposed risk treatment options are feasible. These policies can be classified as inner or outer contexts of the organisation (Waring and Glendon, 1998).

In the process of risk identification, those risks that need to be managed are listed and assessed to see if the organisation has control over each risk. In the next stage of the process, risk analysis, estimates of likelihood and consequence (a combination of exposure and probability) are established but in the light of existing control measures. These risks must be classified in terms of exposure and severity to provide the relevant data to assist in the treatment of the risks. During the risk assessment stage of the process, those levels of risk identified during the risk analysis can be compared with previously established risk criteria or used as a benchmark of performance. The benchmarking of management procedures enables comparisons of corporate standards to be made against industry best practice (Zairl and Leonard, 1996). The decisions on whether the risks can be accepted can then be made in context of the risk tolerability of all parties concerned (AS / NZS, 1995). Where decisions conclude that the risks are unacceptable, the process of risk treatment is used to identify the range of options for treating the risk, evaluating those options, preparing risk treatment plans and implementing those recommended plans and policies (AS / NZS, 1995). The whole process is then continually monitored and reviewed through reliable and valid procedures to assess the influence of risk treatment plans and to make further modifications as required.
1.2.3. The history and development of risk management in health and safety

Legislative interventions, which were intent on improving health and safety of the workforce, date back to the early 19th century. However, the process of risk management only emerged in the 1970’s as a multidisciplinary enquiry that employed engineering and natural science methodologies in the service of measuring, predicting and managing a large class of events that were presumed to have physical and biological causes as their basis (Thompson, 1990).

Within the UK, risk management first became prevalent following the Health and Safety at Work Act (HASAW) (1974). This Act, which is a criminal statute, aims to protect all persons against risks to health and safety arising out of or concerning the activities of an employer. The general duty comes under section 2(1) of the Act, where it states:

'...it shall be the duty of every employer, [so far as is reasonably practicable], to ensure the health, safety and welfare[at work] of all his employees'. (section 2.1)

The meaning of the term so far as is reasonably practicable, although not formally defined in health and safety law has been established in case law (Edwards vs. National Coal Board, 1949). The HSE (1997) and law courts accept that the statement means:

'...the degree of risk in a particular activity or environment can be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid the risk. If these are so disproportionate to the risk that it would be unreasonable for the persons concerned to have to incur them to prevent it, they are not obliged to do so'. (p.42)

The introduction of the Management of Health and Safety at Work Regulations (1992) (MHSW) formalised a risk assessment approach that was always implicit within the HASAW Act (1974). These regulations are regarded as an extension of the duties laid down in Sections 2 – 8 of the HASAW Act (1974). In addition, the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1985) (RIDDOR) is a further piece of legislation developed for health and safety management. One purpose of the Regulations is to provide reports to the Health and Safety Executive or the Local Authority of any events resulting in accidents or violence at work.

The development of risk assessment control concepts within the UK has therefore primarily been through health and safety management and through the onus of central government regulations. The risk management process has consequently become an important tool in the
design and implementation of government policy and in criminal prosecution in relation to health and safety issues within the UK. In addition to criminal prosecution, risk has also become useful in civil law cases. Civil courts in the US have become the most powerful institution in the modern state for the regulating of risk, with civil damage judgements serving as the most effective public policy instrument for internalising costs to the parties, i.e. the risks, that generate them (Priest, 1990). With the principal function of modern civil law, in relation to health and safety, being to control risk, such principles have been predominantly used in fields involving personal injury.

The principles of risk are also an essential part of the insurance industry. The primary function of insurance is to reduce risk of loss by spreading the costs associated with risks over a broader probabilistic base (Priest, 1990). The legal transfer of risk from one company to another, as provided by insurance companies, covers insurance policies such as employers’ liability, public liability, product liability, and loss from fire and transport liability. Some organisations choose to retain the risk within their structure either through knowledge, i.e. the self-insurance approach, or ignorance, which is due to poor hazard identification and risk assessment.

In the USA, the development of risk assessment, which can be traced back to 1975 was focused on regulatory control of chronic health risks (Paustenbach, 1995). Health risk assessment is a separate and distinct discipline, which uses toxicology data collected from animal studies and human epidemiology. These data are combined with information about the degree of exposure, to quantitatively predict the likelihood that a particular adverse response will be seen in a specific human population (Paustenbach, 1995). There is a difference between the approach within the UK and US in the application of risk management. In the UK, the health and safety legislation is primarily aimed at the risks in the workplace that will influence the employees working in that environment. In the US, the health risk assessment process is assessed in terms of population exposure and not workforce exposure. However, health risk assessment within the UK should also assess the influence of health risks to the population as clearly stated within the HASAW Act (1974):

‘...to protect persons [other than] employees against risks to health or safety arising out of or in connection with the activities of an employer’. (section 3.1)
1.2.4. Implications of risk management in professional football

The legislative interventions designed to improve the health and safety of the workforce are also applicable to the professional football industry. It should be remembered that the professional footballer is subject to the same requirements of health and safety legislation as in most other occupations (Fuller, 1995). Application of the HASAW Act (1974) shows that the concept of at work, as it relates to sportspeople, includes the time during which a sporting event takes place, time before and after the event whilst at the location of the event, time travelling to and from the event if travelling together as a team and time spent training (Fuller, 1995).

The two main regulations of the MHSW (1992), which affect the professional footballer are Regulation 3, Risk Assessment and Regulation 5, Health Surveillance (Fuller, 1995). Depending on the resources and support services within a professional sports club, Regulation 6, Health and safety assistance, and Regulation 8, Information for employees, can also affect the professional sports employer. These Regulations have become even more important following the recent successful case of Michael Watson, against the British Board of Boxing Control, for failing to provide adequate appropriate medical assistance at the ringside (Hamlyn, 1999). The fact that this test case was in boxing is irrelevant, as its ramifications will be relevant for every sport. Assuming the employer adhered to all of these Regulations, the professional sports-person must then adhere to the information provided to them by their employer or they could fall foul of Regulation 12, Employees’ duties.

There is one other piece of legislation that is important for the risk management processes and that could potentially have the greatest impact on the professional sportsperson if fully implemented (Fuller, 1995). The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1985) (RIDDOR) requires the reporting of identified accidents or injuries, e.g. fractures, to the appropriate authorities. In addition, any injury where an employee is incapacitated from his normal work for more than three days through injury or an accident within the workplace must be recorded. Hawkins and Fuller (1999) have reported that 84% of all injuries recorded during a prospective epidemiological study of professional football injuries were reportable under RIDDOR regulations. The collection of data through the formal regulations of RIDDOR provides a valuable source of information that can be used during the risk identification, analysis, assessment, treatment and monitoring processes.

In general, the control of risk has principally been through modern civil law, with the situation no different in professional football. In the UK, there have been a number of civil...
cases in the past decade which have highlighted the delicate situation in which professional footballers work. In the case of Saunders vs. Elliott, Elliott attempted to sue Saunders over a tackle, which ruptured his knee ligaments and led to a premature end to his career (Randall, 1994). In this case the court ruled against Elliott and no damages were awarded, as it could not be proven that the injury was caused intentionally or by reckless disregard. In a more recent publicised case, Gordon Watson became only the second player in the history of the game to prove negligence against another player (Kevin Gray) and vicarious liability against the club (Huddersfield) leading to a civil award approaching £1M (Bunyan, 1999). The successful claim was because Watson had proven,

'...on the balance of probabilities that a reasonable player would have known that in challenging in such a manner there was significant risk of serious injury' [NEED PAGE NUMBER]

The fact that there have not been many more civil cases is surprising considering the level of foul play prevalent in professional football. John Crane (England / Arsenal team doctor) had disclosed that he and Arsenal physiotherapist Fred Street had established that 18% of injuries were due to foul-play - this created prima facie breaches of the law justifying criminal or civil proceedings (Grayson, 1994). More recently, Hawkins and Fuller (1998a) used match analysis techniques to identify that 15% - 28% of injuries in European, World and English national football were due to foul play.

As in all other industries, insurance is also used in professional football for the purposes of risk transfer. This is accomplished through private medical cover and career-ending insurance, while clubs may also contribute to a player’s personal insurance cover taken out to protect against loss of earnings from a career ending injury.

1.2.5. Risk theory

In response to the growth in interest in the subject of risk during the 1970’s and 1980’s, the Royal Society, Britain’s pre-eminent scientific institution, published a report titled ‘Risk Assessment’ (Royal Society, 1983). This report was scientifically based and constructed from a positivist paradigm, yet the report distinguished between two different types of risk:

i) objective risk – risk studies by experts, statistical probability of an event happening, and

ii) perceived risk – views of non-risk experts i.e. the general population.
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The general population often have a different perception of risk events from those suggested by the objective statistical assessments made by the ‘risk experts’ (Royal Society, 1983). Despite identifying the importance of the difference between the two viewpoints, the report maintained a positivist paradigm structure.

In response to the developments of a post-positivist era, a second report was produced by the Royal Society (1992). Despite the report trying to stress the importance of the post-positivist paradigm to risk research, this view is contradicted within the 1992 report (Adams, 1995). The physical scientists responsible for constructing the report found it difficult to accept that risk could be culturally constructed and that it was influenced by subjective opinion. The view that there is a distinction between objectivism and subjective risk is still the mainstream position in safety and risk management literature (Adams, 1995). This is despite the fact that when accident rates have been used retrospectively as a measure of risk, any low reportable values may not necessarily indicate that the risk was low. It could be that those individuals exposed to the environment perceived a high risk and the risk was then avoided (Adams, 1995).

Based on 15 years of research into risks on the road, Adams (1995) provided evidence to suggest that individuals modify their levels of vigilance and their exposure to danger, in response to their subjective perceptions of risk. This change in behaviour highlights one of the major weaknesses with the physical sciences. As individuals and institutions respond to their perceptions of risk in a non-logical fashion, they ‘alter that which is predicted as it is predicted’ (Adams, 1995). The government now acknowledges this fact by recognising that the management of risks solely based on probabilistic estimates for physical harm is unlikely to succeed. The government has identified the need to integrate public values and perceptions of risk into the process (HSE, 1998).

As part of Adams’ suggestions, he has proposed the theory of risk compensation to illustrate the circularity of relationships that frustrate the development of objective measures of risk, Figure 1.2.
Figure 1.2. The theory of risk compensation (redrawn from Adams, 1995)

The model postulates that:

- everyone has a propensity to take risks,
- this propensity varies from one individual to another,
- this propensity is influenced by the potential rewards of risk-taking,
- perceptions of risk are influenced by experience of accident losses – one’s own and others’,
- individual risk-taking decisions represent a balancing act in which perceptions of risk are weighed against propensity to take risk,
- accident losses are, by definition, a consequence of taking risks; the more risks an individual takes, the greater, on average, will be both the rewards and losses he or she incurs.

Adams (1995) states that the model is an impressionistic, conceptual model, not an operational one. Furthermore, Adams states that the contents of the boxes are not capable of objective measurement. When measuring rewards and losses however, the Royal Society
(1983) defines detriment (loss) as a numerical measure of the expected harm or loss associated with an adverse event.

1.3 THE ECONOMICS OF HEALTH AND SAFETY MANAGEMENT

Within risk management, the concept of 'as far as is reasonably practicable', 'as low a level as is practicably possible' and 'maintaining risks within tolerable limits at proportionate cost' is a common thread. All three definitions provide a limitation on the procedures implemented within industry to reduce the level of risks to health and safety to an acceptable level. However, all organisations have limited resources, which are invariably linked to the profitability of the organisation. Therefore management decisions must be made as to where, when and how these resources are allocated to health and safety within an organisation. The total costs of health and safety ($C_T$) in an organisation are dependent on the costs of prevention ($C_P$), costs of assessment ($C_A$) and the costs of failure ($C_F$), Figure 1.3. Such costs are also dependent on the current standards of health and safety within an organisation. A profitable organisation will minimise its risks, and hence its costs, thereby reducing the long-term average costs within the organisation (Fuller, 1998).

In Figure 1.3, the position RM where health and safety costs are at a minimum represents the optimum standard in health and safety for an organisation to operate based on economic principles. This position also leads to the lowest possible health and safety costs. Position HSM represents those organisations that are seeking to reduce the level of accidents and injury to a minimum but as such will incur high health and safety costs. Position PM is indicative of an organisation with poor health and safety management and also high total health and safety costs (Fuller, 1998).
These economic principles can be applied to professional football. The total costs of the health and safety of the organisation would refer to those costs incurred due to players' injuries. For a professional football club, where it is assumed that players' injuries will influence team success, such costs will include the following:

- time spent by medical and training staff during the period of injury and rehabilitation
- cost of loaning / purchasing a replacement player to cover the period of injury
- reduced income from lower match attendance figures
- elimination from cup competitions
- reduced income from league placing
- failure to qualify for European competition
- loss of broadcasting revenue
- loss of advertising revenue
- loss of benefit of player salary

Based on recent epidemiological studies on the incidence of injury in English professional football, where the injury frequency rates were one thousand times greater than other perceived high risk UK industries, e.g. coal-mining and construction (Hawkins and Fuller, 1998).
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1999), it can be assumed that the typical professional football club is currently located at position PM. With the incidence of players' injuries being so high, the costs incurred are also likely to be high due to the asset value of the players (Boon et al., 1999a). The ideal position would be for clubs to migrate to position RM through appropriate implementation of risk management procedures that are related to the reduction of players' injuries.

The investment by football clubs in resources to promote the movement from position PM to position RM in Figure 1.3, is dependent on the level of medical care and treatment, Figure 1.4 (Santerre and Neun, 1996). This figure shows that there is a diminishing improvement in recovery time from injury and ill health with an increase in the level of medical care and treatment. As player absence is likely to constitute the greatest proportion of losses from illness and injury because player salaries account for the majority of turnover, it is important for clubs to reduce the period of absence by investing in the resources required to achieve this objective. However, the law of diminishing marginal productivity shows that recovery time decreases from injury and ill health at a progressively slower rate with proportional increases in the quantity and quality of medical care and treatments, assuming all other inputs are constant. Clubs must therefore consider their financial constraints and the influence on recovery time when making decisions on investments and procedures that could be used to promote the migration of the club from position PM to position RM.

![Diagram](image)

**Figure 1.4** The law of diminishing marginal productivity for healthcare investment (redrawn from Santerre and Neun, 1996)
1.3.1. Cost benefit analysis (CBA)

The process of decision making for the implementation of health and safety measures requires an evaluation of the costs and benefits of the proposed project. In a recent report on the economic importance of health and safety measures produced by the European Commission (1999), cost benefit analysis (CBA) was identified as the best known tool to evaluate the costs and benefits of occupational, safety and health measures. The need to achieve balance between the extent to which risks are prevented or controlled and the resources allocated for achieving these objectives is a delicate trade-off process, also recognised by UK government regulators and policy-makers (Health and Safety Executive, 1998).

Cost-benefit analysis provides a simple formal analytical technique for comparing the negative and positive consequences of alternative uses of resources, which in effect is a simple attempt to weight the pros and cons of a decision. The principal objective of a CBA is to structure and analyse information that will inform, and thereby assist policymakers and managers (Warner and Luce, 1982). Cost benefit analysis is already used as a tool within political decision making by the majority of European Member states but the impression is that ethical considerations are still predominant (European Commission, 1999; HSE, 1998). Member states have also indicated that there are many problems in estimating the benefits, including a lack of reliable data, difficulties in isolating relevant factors, and the fact that benefits often become apparent only after some time. This is especially true when CBA is used in the health and medical field (Santerre and Neun, 1996). Despite these criticisms, CBA is superior to any alternative method for analysing project investment and provides a universal monetary value to any project because of the role of CBA in consciousness raising, decision assisting and decision making (Sloan, 1996).

There are six basic steps in any CBA used within health care, which include the following (Sloan, 1996):

1. Definition of the intervention e.g. nature of intervention.
2. Identification of relevant costs e.g. direct (medical) costs and indirect costs (time, lost earnings).
3. Identification of relevant benefits e.g. net health benefits to patient, greater productivity.
4. Measurements of costs e.g. by attaching a monetary value to all cost components.
5. **Measurement of benefits** e.g. by converting all benefits into a single metric value (pounds) and where costs are incurred in the future, apply a discount value.

6. **Accountability of uncertainties** – the robustness of conclusions in the measurement of costs can be tested by sensitivity analysis or Monte Carlo simulation.

When evaluating health benefits, there are three tools available to the analyst. The first approach, the human capital method, views the value of personal health benefits as the economic productivity they permit to take place (Warner and Luce, 1982). In the instance of a professional footballer this relates to the availability of the player for selection, the time spent training, and the player’s contribution to team performance. Although the human capital approach is the most widely used technique, it has many shortcomings in that it fails to consider non-market returns the individual might receive from other activities such as leisure, pain and suffering from the pleasure of life itself. An analyst also needs to estimate the discounted value of future earnings resulting from an improvement in or an extension of life (Santerre and Neun, 1996).

Another method that is used to calculate the benefit of an investment project is the ‘willingness to accept’ or ‘willingness to pay’ approach. This method measures what value individuals place on reducing the risks of injury / death (Warner and Luce, 1982) or it can be defined as the maximum amount of goods, measured in monetary terms, which an individual would be willing to sacrifice to obtain the benefits from a programme (Pauly, 1996). The benefit of a programme in terms of economic theory can then be defined as the sum of the willingness to pay for all persons whose welfare is affected by the programme (Pauly, 1996). In economic theory, the ‘willingness to pay’ definition is the only acceptable definition. The most direct method to measure willingness to pay is a questionnaire approach asking how much people are willing to pay to avoid risks.

The ‘willingness to pay’ method is subject to criticism based on objections to the technique in terms of income. There are also conceptual obligations where pounds of net benefit not gross benefit need to be weighted, and some do not feel that individual preferences should be a guide to resource allocation. Arguments against the assumption that happiness and well being of the community is the sum of individual well being is a further factor for consideration. Finally, the feasibility of the validity of measurement of willingness to pay relative to measures of effectiveness has also been identified as a weakness of this technique (Pauly, 1996).
Other typical approaches used to value the benefits of a program include the use of court awards in civil cases as an estimate of productive value lost (Warner and Luce, 1982). Within professional football to date, there have only been two civil cases that have been won by a player who has had his career influenced by injury. This is because the majority of cases brought within professional football are settled out of court (Grayson, 1999). The most recent case led to nearly £1M being awarded by the law courts to Gordon Watson after having his leg broken and career restricted by an unlawful tackle (Bunyan, 1999). In the only other case to date, Brian McCord, a former Stockport County player won approximately £250,000 in damages. This was awarded three years after the Swansea City skipper John Cornforth, according to Mr Justice Ian Kennedy made ‘an error inconsistent with his taking reasonable care’ (Grant, 1998). With only two cases having gone to court there is insufficient evidence to use this method when calculating benefits within this field of research.

1.3.2. Costs of injury and ill-health

With the growth in the use of CBA in industry and by the UK government to assess the likelihood of project investment, there has also been an interest in the direct measurable costs of injury and ill health. Davis and Teasdale (1994) produced an evaluation of the costs to the British economy of work accidents and work-related ill health. This report summarised these costs for the year from three perspectives; the individual victims and their family (£4610M), their employers (£4332M - £9453M) and society as a whole (£10968M - £16336M). Although this report has been heavily criticised on a number of issues (Cutler and James, 1990) the key factor is the sheer magnitude of the costs of injury and ill health. These costs alone should be sufficient to raise the awareness of the importance of managing health and safety from all three perspectives.

A similar approach can be taken in a smaller population such as professional footballers to evaluate the costs of injury in the professional sporting arena. The three perspectives that can be cost analysed include the player, the football club and the national football industry. There has been little work done in the UK to specifically evaluate such costs but there has been some costing of amateur sports injuries. Nicholl et al (1993) looked at the total annual costs of new exercise related injuries, excluding catastrophic injuries and fatalities in England and Wales. For an individual, it was calculated that the average treatment costs for a 15 – 44 year old currently exercising was £43 per year. The cost to society was estimated to be £643M of which direct costs were £238M and indirect costs £405M. There was an additional cost of £354M (£184M for direct costs and £170M for indirect costs) for
all treatment of recurrent problems. There was no measure of pain and suffering built into this analysis. For a more specific injury, it was estimated that the 42 spinal cord injuries in the UK that year had estimated direct costs of £17.9M. As these costs were all assumed to occur in people aged 15 - 44 years, there was an additional healthcare cost of nearly £1 per person in that age group.

As a comparison, Harlan et al (1990) presented data from a 1980 survey from a civilian, non-institutionalised population of the USA, and estimated the costs of injuries to the 17-44 year old age group to be $16.8Bn. This figure represented just 12% of the total direct costs. A later survey by Tsai et al (1989) looked at the nature and magnitude of injuries in a population size of 20,705. The total costs of occupational and non-occupational injuries were $4.97M. By regressing this value to the total US population at a single time point (1975) it was conservatively estimated that the direct medical expenses and indirect productivity losses were between $75Bn to $100Bn annually. In Holland, sports injuries were estimated to account for $54M in 1988 (van Beeck et al, 1997). In Denmark, based on 1975 prices, the cost of an acute sports injury was estimated to be £245 (Sorensen and Sonne Holm, 1980). De Loes (1990) estimated the mean cost of an injury in a small Swedish municipality to be £225 ($335).

A more specific cost analysis of two sporting injuries by Tolpin and Bentkover (1981) in the USA, calculated the cost of a severe corneal abrasion to be $8216. A more severe spinal cord injury was calculated as $0.5M to nearly $0.75M depending on the discount rate applied. More recently, de Loes et al (2000) reported on a seven-year study on the costs of knee injuries in male and females, aged between 14 - 20, during the period 1987 to 1993. The mean cost of knee injury was US$1131 for females and US$1097 for males. The mean costs were much higher for those females who received a knee injury in soccer (US$1861).

The only costing work in professional football has been conducted by Ekstrand (1982) on Swedish clubs. He estimated that the total cost of injuries to the whole of Swedish Division IV clubs was 790,000 Sw.Kr. These costs consisted of medical consultations and assessments, hospital costs, surgery costs and sick leave. The greatest proportion of the costs was due to sick leave, accounting for 62% of the total costs. Much of this cost analysis is not transferable to English professional football because much of the medical costs are covered under private medical insurance taken out by the respective clubs. In addition, many more additional costs are incurred through other insurance policies to cover for the players, e.g. career ending insurance. It is clear however, that individual sports
injuries do account for relatively high direct medical costs to the clubs concerned. The true costs to the clubs are much greater because of the potential losses through indirect sources.

1.4 FINANCIAL AND ECONOMIC ASPECTS OF PROFESSIONAL FOOTBALL

One of the major justifications for the application of risk management principles in the professional football environment has been the growth in value of players. This growth has been particularly rapid since the formation of the Premier League. To position the thesis in the context of the financial development of the football industry therefore, it is essential to review these financial changes and to outline the academic developments within the economics of professional football. This also permits the second process of risk management, risk evaluation and cost-benefit analysis, the foundation of the thesis, to be applied in a modern business context.

The majority of previous studies on financial and economic aspects of professional football have been concerned with three major issues:

1. Estimating the demand for professional team sports (e.g. Simmons, 1996; Dobson and Goddard, 1995; Cairns et al, 1986; Jennett, 1984; Gratton and Taylor, 1986)

2. Identifying the objective function of professional football clubs (e.g. Cairns et al, 1986; Sloane, 1971; Arnold and Benveniste, 1987).

3. Identifying the relationship between performance and revenue in professional football (Dobson and Goddard, 1998a; 1998b; Syzmanski and Smith, 1997).

Since the introduction of the Premier League in the 1992/93 playing season however, there has been much more interest in the financial reporting within professional football. Management accountants, Deloitte and Touche, produce an Annual Review of Football Finance based on financial reports they have received from professional football clubs. This annual report has become a permanent important fixture in the football business calendar. The report provides a benchmark from which most clubs can compare their financial performance against the ‘average’ club for their respective leagues. For many loyal football supporters the integration of business into football is against what they see as the ‘spirit’ of the sport. However, no organisation can expect to receive income from sponsors, broadcasters or spectators whilst avoiding the responsibility to operate within business principles. With all the
status that football generates also comes accountability through both playing and financial performance (Boon et al, 1999b).

1.4.1. Financial overview

Table 1.1 presents the average turnover and profit (loss) for the four professional football leagues within England for the period 1991 to 1998. Although the summary information in Table 1.1 provides an indication of the financial health of the English football industry, it is clear that there are huge discrepancies in the average level of turnover and pre-tax profit (loss). The primary reason for this is the money that is spent on transfers, which represents the largest influence on any club’s profit or losses, and how it is accounted for in the balance sheets. There are also many inconsistencies in the way that clubs account for their income and expenditure. In 1992, 87% of clubs surveyed indicated that they accounted for their transfer fees through profit and loss accounts, 58% of clubs did not disclose signing on fees and twenty-four out of forty-six clubs surveyed did not depreciate ground facilities (Boon, 1992). More recently, the April 1999 budget brought some consistency into the accounting of football clubs, with transfer fees now having to be written off over the period of the player’s contract. During the period (1992/93 to 1997/98) of the annual football review publication however, there was only a small minority of clubs who followed a consistent practice when dealing with player transfers by writing them off in the year the transfer occurred. Furthermore, an increasing number of clubs began to show the value of their playing squad within their accounts but the methods available for squad evaluation were not consistent between clubs and were open to subjective evaluation. Clubs also tend to report their financial reports at different times of the year, which has an influence on the data available for the survey of football club accounts.
Table 1.1. The financial performance of the ‘average’ English professional football club from 1991/92 to 1997/98 as a function of playing Division

(Barton et al, 1997; 1998; Boon, 1993; Boon et al, 1994; 1995; 1999a; Thorpe et al, 1996)

<table>
<thead>
<tr>
<th>Playing season</th>
<th>Financial parameter</th>
<th>Premier League</th>
<th>1(^{st}) division</th>
<th>2(^{nd}) division</th>
<th>3(^{rd}) division</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991 / 92*</td>
<td>Turnover (£000s)</td>
<td>7287(^a)</td>
<td>2864(^a)</td>
<td>1184(^a)</td>
<td>624(^{aa})</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>(157)(^a)</td>
<td>(440)(^a)</td>
<td>(315)(^a)</td>
<td>(55)(^{aa})</td>
</tr>
<tr>
<td>1992 / 93</td>
<td>Turnover (£000s)</td>
<td>9164</td>
<td>3062</td>
<td>1492</td>
<td>757</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>523</td>
<td>(103)</td>
<td>(106)</td>
<td>10</td>
</tr>
<tr>
<td>1993 / 94</td>
<td>Turnover (£000s)</td>
<td>11499</td>
<td>3990</td>
<td>1422</td>
<td>995</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>583</td>
<td>(487)</td>
<td>0</td>
<td>(57)</td>
</tr>
<tr>
<td>1994 / 95</td>
<td>Turnover (£000s)</td>
<td>14675</td>
<td>3625</td>
<td>1807</td>
<td>1082</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>286</td>
<td>(546)</td>
<td>(222)</td>
<td>(145)</td>
</tr>
<tr>
<td>1995 / 96</td>
<td>Turnover (£000s)</td>
<td>16951</td>
<td>4551</td>
<td>1864</td>
<td>1024</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>(3287)</td>
<td>(786)</td>
<td>(420)</td>
<td>(89)</td>
</tr>
<tr>
<td>1996 / 97</td>
<td>Turnover (£000s)</td>
<td>21639</td>
<td>6900</td>
<td>2552</td>
<td>1092</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>515</td>
<td>(1357)</td>
<td>(253)</td>
<td>(257)</td>
</tr>
<tr>
<td>1997 / 98</td>
<td>Turnover (£000s)</td>
<td>28459</td>
<td>7304</td>
<td>2757</td>
<td>1131</td>
</tr>
<tr>
<td></td>
<td>Pre-tax profit / (loss) (£000s)</td>
<td>1010</td>
<td>(1394)</td>
<td>(555)</td>
<td>(257)</td>
</tr>
</tbody>
</table>

* For playing season 1991 / 92, the leagues were classified as Division 1,2, 3 and 4.
\(^a\) = 21 clubs only, \(^{aa}\) = 20 clubs only.

Despite the financial inconsistencies, the Annual Review of Football Club Finances continues to provide valuable information on the state of the football business. Furthermore, the reports provide additional details on season specific parameters, e.g. influence of the Taylor report on ground and stadia expenditure. These trace the growth of the industry since the formation of the Premier League and are beneficial in explaining the trends in turnover and profit (loss).
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These financial reports have also indicated that the biggest factor that has had an influence on the balance sheet is player transfers. There has been a continual growth in the money spent on purchasing players since the formation of the Premier League (1992/93: £73M, 1993/94: £92M, 1994/95: £110M, 1995/96: £250M, 1996/97: £250M, 1997/98: £228M) with a parallel fall in the money filtering to the lower divisions. Much of the transfer activity in terms of financial expenditure, the majority of which is from the Premier League clubs, now filters money into European clubs. In 1997/98 only £1.5M of Premier League transfer money passed into the Football League, resulting in these clubs having to develop alternative methods of income generation (Boon et al, 1999a). As many of the Premier League clubs also have more professional and extensive scouting systems to 'cream off' the best youth players, many of the Football League clubs can no longer compete in this area. Consequently, they cannot recruit local talent and use such players at later stages to generate transfer income (Boon et al, 1999a).

With the increase in transfer fees, there has also been a vast growth in the wages and salaries of professional footballers. This is partly due to the change in player contract law through the Bosman ruling, which became active during the 1995 / 96 playing season. Wages and salaries continually account for a large proportion of total turnover (1993/94: 55%, 1994/95: 52%, 1995/96: 58%, 1996/97: 55%, 1997/98: 59%) increasing at a much greater rate than inflation and often exceeding the growth in turnover (1994/95: 13%, 1995/96: 23%, 1996/97: 25%, 1997/98: 33%).

1.4.2. Financing professional football clubs

Prior to the 1970's, many directors and shareholders who invested in football clubs did so not because of expectations of pecuniary income but for such psychological reasons as the urge for power, desire for prestige, propensity for group identification and the related feeling of group loyalty (Sloane, 1971; Dalton, 1985). As such, the primary objective of the football club was utility maximisation, which was taken to imply maximisation of playing success.

Over the past decade however there has been a change in the methods used to finance investment within professional clubs. By April 1999, twenty clubs had floated on the stock exchange and were therefore answerable to shareholders and investment groups from the City (Harverson, 1999b). The ability for clubs to raise finance through flotation was predominantly the result of the vast increase in income through the selling of broadcasting rights to BSkyB. Many city investors could foresee vast areas of growth in the football industry and as a result purchased shares within the football business in the hope of a substantial return. The major
objective of clubs floated on the stock exchange, according to the view of economists, is primarily for profit maximisation (Cairns et al, 1986). It has become increasingly evident therefore that clubs can no longer distinguish between the two business objectives of profit and utility maximisation as playing success will be one of the major factors that determine profitability (Beneviste, 1985).

Stock flotation is only available to a limited number of clubs however, leaving the remaining clubs that account for the majority of the Football League, still reliant on alternative sources of financial backing, Figure 1.5. The majority of such clubs have lived on the brink of financial failure (Arnold and Beneviste, 1987; Barton et al, 1997; 1998; Boon, 1993; Boon et al, 1994; 1995; Jennett and Sloane, 1985; Thorpe et al, 1996;) operating on the business objective of security maximisation. The objective of security maximisation is focused on maximising the security level of the organisation through transfer fees, solving the problem of financial insolvency in the short run but minimising long term playing success (Sloane, 1971).

Figure 1.5. The historical pattern of funding in professional football (redrawn from Barton et al, 1998)

The major funding sources responsible for football funding in the playing season 1997/98 (latest available figures) indicate that bank finance, share capital, loans, retained profits and
leasing / hire purchases are the chosen methods of income generation (Boon et al., 1999a). Together these sources led to investment of £729.4M in the playing season 1997/98, a 35% increase on the previous season. Share capital and retained profits accounted for 60% of this figure compared to other sources (banks: 0.2%, loans: 36%, leases: 3.8%). It is clear that private and shareholder investment is of increasing importance but this is primarily due to clubs floating during the analysis period of the published financial reports. Flotation’s help provide new additional money to the football business but for a club to achieve a successful flotation they must have the following (Boon et al., 1999a):

- high average attendance,
- successful commercial management,
- efficient controlled financial expertise,
- a business philosophy and code of ethics to pass the ‘Corporate Governance test’,
- a highly skilled playing squad, which has the ability to maintain Premier League status.

The funding of professional football will become increasingly focused on the elite clubs. Pay per view for broadcasting rights has already been experimented within the season 1998/99 at Sunderland F.C. (Column, 1999). Chelsea has also looked into the Eurobond market, which could raise a potential £75M for Chelsea Village (Cave, 1997a). More recently, Sampdoria created a bond issue that was related to club performance. If the club is promoted from Serie B to Serie A the value of the bond issue would increase (Betts and Harverson, 1999). In addition to these options of income generation, clubs are attempting to increase their income from other commercial sources. Some clubs offer savings accounts for their supporters (Ellis, 1998), others run their own travel clubs, provide conferencing facilities, run their own TV channels, internet pages, and use other innovative ideas such as sponsorship - naming rights, e.g. McAlpine stadium, Cellnet Stadium, Reebok Stadium, to generate additional income. With a fall in football kit merchandising (Harverson, 1999a), additional sources of revenue are increasingly important in order to remove the risk of playing performance having too drastic an influence on the financial status of the club. Commercial activities and merchandising still account for 38% of the total income in the Premier League (Boon et al., 1999a).

The most recent development with football funding is due to the vertical integration with media companies. This is already a common feature within European football, yet a similar trend has only begun to emerge within the Premier League. Although the take-over of Manchester United by BSkyB was blocked by the Monopolies and Mergers Commission,
there has been some minor integration of media companies and football clubs. The recent mergers simply reflect the desire for media companies to protect their position against the decision on the collective selling of Premier League television rights from the Restrictive Practices Court. The current mergers include:

- Granada and Liverpool.
- Scottish Media Group (SMG) and Hearts.
- BSkyB and Leeds United, Manchester City, Sunderland and Manchester United.
- Premium TV (arm of NTL) and Newcastle United.
- NTL and Aston Villa, Rangers and Leicester City.

There are likely to be many more developments in the future based on the government’s report on guidelines for the ownership of football clubs by media companies and the issues surrounding UEFA and multi-club control. In this instance, the European Court of Arbitration has ruled in favour of UEFA’s decision not to allow clubs under common ownership to participate in the same UEFA competition. The decisions from these high level cases are likely to change the face of English football funding in a drastic way. Manchester United, the world’s richest club has already complained about the level of media money it currently receives, in comparison to its Italian and Spanish rivals, under pay-per-view deals, due to restricted practices within the UK (Potter, 1999).

1.4.3. Quoted football clubs

The trend for City investment groups to delve into the football business was primarily due to the vast growth in income through the purchasing of broadcasting rights by BSkyB. Together with the promise of vast income growth in pay-per-view television and the untapped markets of merchandising, many investors could foresee substantial returns on their investment. The total market capitalisation for the twelve clubs listed on the London Stock Exchange and the eight clubs on the Alternative Investment Market (AIM) at the time of their flotation has been valued at £857.6M. This total market value peaked at £2047.3M, but at the end of the 1997/98 playing season the total market value was only £1157.8M, 35% greater than the initial flotation value (Boon et al, 1999a). This trend for clubs to float on their respective stock exchange is beginning to occur in other European countries, e.g. Roma in Italy (Betts, 1999), and Borussia Dortmund in Germany (Althaus and Harverson, 1999).
Manchester United generates the greatest turnover of any football club in the world (Boon et al, 1999b). Despite this vast income even their share price has fallen by 13% from its peak value and it is one of only three English clubs to have achieved an increase in the share value from its flotation price since June 1997. The major reason for this share strength is the off-the-field commercial ventures which do not tend to be as influenced by how well the team is performing (Harverson, 1997b). In general however, the financial reports have clearly illustrated the fragility between playing and financial performance within the football business, Table 1.2.

Over the past three seasons while the football industry has sought to stabilise its operations on the stock market there have been many factors that have influenced the performance of the share price. Injury to key players has directly influenced the fluctuations in share prices of Newcastle and Tottenham Hotspur (Beugge, 1997; Cave, 1997b; Halliday, 1998), as have changes in club board and player management (Lovejoy, 1998; McGookin, 1998). The huge transfer spending by Premier League clubs that diminishes the profitability of the club concerned (Cave, 1997b; Harverson, 1997d; Arends, 1998; Harverson, 1999c) and the growth in players’ wages, which account for a large proportion of the club’s turnover, have also caused a downturn in share value (Harverson, 1998a; 1999b). The more recent case involving the Office of Fair Trading (OFT), which was investigating the monopoly and overpricing of TV rights between BSkyB and the Premier League, also went under judgement in the Restrictive Practices Court (Harverson, 1999d). If the judgement had gone in favour of the OFT, individual clubs would have been able to negotiate their own individual deals, which would have further widened the gap between the Premier and Football League clubs.

On a more positive note, the discussions and recent trials of pay-per-view television (Bose, 1998a; 1998b; Column, 1999), the launch of TV channels by football clubs (Harverson, 1998b; Cave, 1997c), and the change in format and potential income from European competition (Bose, 1998c) have had a positive response from the stock market, and these will all influence the stability of the football business. More recently, the potential take-over bid of Manchester United by BSkyB caused an upturn in the financial market of the football business for all listed clubs (Anderson, 1998; Potter, 1998; Newman, 1998). The eventual decision by the Monopolies and Mergers Commission to refuse the take-over caused a downturn in the football market and has caused concern in the City due to the restriction of expansion for their investments (Harverson et al, 1999; Harverson, 1999c; Clark, 1999). The more recent investment by media companies in football clubs, e.g. Granada and Liverpool, led to an increase in share price for Tottenham Hotspur, Sunderland and Newcastle United (Summary Staff, 1999a). This move has clearly shown that the vertical integration of media
companies with football clubs is still alive as media companies are willing to take the risks associated with such partnerships. Further speculation in the football market of media investments tends to have a positive response on share price for the club concerned (Garrahan, 1999; Croft, 1999).

Table 1.2. Examples of the influence of playing performance on share value for clubs floated on the London Stock Exchange and Alternative Investment Market

<table>
<thead>
<tr>
<th>Date</th>
<th>Reporter</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/5/97</td>
<td>Beugge, 1997</td>
<td>March 5, MUFC win 4-1, shares increase 22.5p to 655p. March 9, MUFC lose 1-0, shares fall 10p to 645p.</td>
</tr>
<tr>
<td>3/10/97</td>
<td>Harverson 1997c</td>
<td>QPR’s share price falls from 72p to 44p after revealing heavy losses due to relegation from the Premier League.</td>
</tr>
<tr>
<td>9/8/97</td>
<td>Harverson, 1997b</td>
<td>Sunderland FC share price fell by 56% after relegation from the Premier League.</td>
</tr>
<tr>
<td>7/3/97</td>
<td>Harverson, 1997e</td>
<td>Share prices of Southampton fell by 50%, QPR by 42%, Sheffield United by 49% due to poor on the field performances.</td>
</tr>
<tr>
<td>28/3/98</td>
<td>Barrow, 1998</td>
<td>After Sheffield United lost the play off final for promotion to the Premier League, shares fell 20p to 44p.</td>
</tr>
<tr>
<td>27/5/98</td>
<td>Harverson, 1998c</td>
<td>Following Charlton’s win in the Premier League play off final against Sunderland, their share value increased by 23% and Sunderland’s fell by 20%.</td>
</tr>
<tr>
<td>12/4/99</td>
<td>Heaves, 1999</td>
<td>Aston Villa shares fell by 2% after hopes of a place in Europe began to dwindle due to a run of bad results.</td>
</tr>
<tr>
<td>21/5/99</td>
<td>Bray, 1999</td>
<td>After winning through to Division one play off final, the shares of Bolton Wanderers increase by 2 to 21p. The failure of Preston North End to reach their respective play off final led to a 25p decrease in share value to 290p.</td>
</tr>
<tr>
<td>7/10/99</td>
<td>Harverson, 1999e</td>
<td>Newcastle United suffered a 9% fall in turnover and 36% fall in pre transfer profits after failing to qualify for Europe in the 1999/00. Earnings per shares fell to 0.6p (1.9p).</td>
</tr>
<tr>
<td>9/2/00</td>
<td>Summary Staff, 2000</td>
<td>Celtic shares fell by 15 to 197.5p (7% decrease) after losing in the Scottish Cup.</td>
</tr>
</tbody>
</table>

Currently, football stocks are generally regarded as a poor investment with low merit. One of the major problems has been the failure of clubs to keep costs down, partly due to the poor management within the industry, but also because both investors and management
underestimated the strong financial motivation of players and their agents (Harverson, 1999g).

1.4.4. The future of professional football in England

The future sources of funding for professional football clubs have been outlined in a previous discussion, but these sources of funding are dependent on the views and likely actions of the football supporters. A prime example is the case of Shareholders United Against Murdoch (SUAM) and their successful case in restricting the take-over of Manchester United by BSkyB (Crowther, 2000). Supporter views are therefore an essential element of any future development within the professional football industry. The Labour government has recently recognised this by establishing a Supporters Trust to provide advice for supporter groups on becoming actively involved in their football clubs (Supporter Involvement in Football Clubs, Birkbeck College, Clore Management Centre, January 27, 2000). With attendance (40%) and other commercial income (36%) accounting for the majority of the average club’s turnover (Boon et al, 1999), it would be irresponsible for clubs to ignore the supporters’ role in the financial stability and success of the club.

The most recent surveys of football club supporters’ views (Salomon Brothers, 1997; Mintel, 1998; Smith and Lejeune, 1998) should therefore be considered in any future development in the football industry. These reports identified the following,

- The strongest growth in revenue has been due to increases in admission costs during the past five years.
- The ‘virtual fan’ is becoming more important due to the coverage of football on satellite and cable television (football accounted for 17.7% of all sport coverage on cable and satellite in 1997).
- Many consumers feel clubs are exploiting them.
- Much greater emphasis on business-like attitudes within the football sector is required to ensure clubs can sustain the expenditure the modern game requires (Mintel, 1998).
- With an increasing commercialisation, fans no longer feel any sense of fairness in the game (Salomon Brothers, 1997).
- High earners (> £30,000) were the least committed attendees of football matches (Smith and Lejeune, 1998).
By using a time series package to forecast the market position in 2002, and by identifying those factors that have greatest influence on the market forces within football, a forecast of the football business was also produced (Mintel, 1998). It was estimated that ticket prices would continue to rise between 6% – 7% per season, which should lead to an increase in revenue of 4% – 5% per annum. This growth rate reflects the progress in the top division and does not reflect what is likely to happen in the lower divisions. The changes in the transfer market have led to the Premier League clubs purchasing cheaper foreign players as opposed to investing in the lower leagues, which has reduced the vast income previously generated from this source (Boon et al, 1999a). This and other market factors are likely to lead to a rationalisation within the industry with many clubs merging, sharing stadia or going out of business (Mintel, 1998). The latest available data for playing season 1998/99 showed that attendance figures had increased once more for both the Premier League (4.8%) and Football League (2%) (Summary Staff, 1999b).

The growth in the professional football industry is also of substantial benefit to the economy of the country. The increased professionalism within the game has allowed one off tournaments, e.g. Euro 96, to become a successful advertisement for the game in the UK. It is estimated that Euro 96 led to an added 0.1% on British Gross Domestic Product (GDP) in the period from April to June, a quarter of the total growth of 0.4%, pushing Britain’s trade balance into surplus for the first time since 1995. The event had a significant impact on the economic returns for the sport, leisure and hotel industries of the host cities (Dobson et al, 1997). The success of this event led the F.A. and collaborative organisations to put forward proposals for the UK to host the World Cup in 2006.

1.5 THESIS STUDY DESIGN

In the review and consequent design of the doctoral thesis, it was identified that there was a dearth of information, which has evaluated the risk of injury within the professional football industry. There are two major justifications for this work to be completed:

1. In the light of the Michael Watson vs. BBBC case, there are potential legal, financial and image ramifications for professional football.

2. To provide a non-regulatory impetus for professional football clubs to recognise and respond to the issue of players’ health and safety.
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The provision of evidence for these justifications can be approached from many perspectives, all of which have a significant influence on risk within professional football (Figure 1.6). However, the greatest effects of injury risk and injury consequence are likely to be experienced by the players (employees), football clubs (employers) and then the supporters and local community (society). There is likely to be some risk and consequence for other interested parties, e.g. F.A., P.F.A., referees, but not to the same magnitude as for the players and their clubs. This is shown by the larger surface area allocated to the players within the model.

Injury risks and consequences are experienced in both the short and long-term. There has been criticism of the risk evaluation process in that it fails to consider those benefits or risks that are not immediately visible. The present design attempts to model both the short-term and long-term consequences through evidence that is already available and the evidence that will be collected and presented within the thesis. For example, the epidemiological studies of Lewin (1989), McGregor and Rae (1996), and Hawkins and Fuller (1999) already provide substantial data on the acute (short-term) consequences of injury within English professional football. The model also allows for the magnitude of injury risk consequences within the design.
Figure 1.6. Injury risk and injury consequence trapezium
In order to understand how injury risk and consequence can influence the action of the employees, employers and society, the risk thermostat model, as remodelled and proposed by Adams (1995) was adopted (Figure 1.7). The model was only used as a structure with which to approach the work and to help in the planning of each element of the thesis. It was not used to prove or disprove the risk thermostat model but merely as a structure from which to plan the thesis.

Figure 1.7. Adaptation of the risk thermostat model used to investigate the impact of injury in professional football

The risk thermostat model can be applied to ascertain the ‘balancing behaviour’ of the players, football clubs, supporters and community, and other factors. Within the time constraints of the thesis and for the reasons identified previously, projects were designed to assess the consequence of injury to professional football clubs and their players only. There is
also likely to be a risk thermostat for supporters, the P.F.A., F.A. etc. but the immediate concern and visible consequence is with the players and their clubs.

The various components of the thesis which make up parts A – D of Figure 1.7 are outlined in Table 1.3. This table lists the evidence sought to fulfil each element of the thesis design when assessing the impact of injury for both professional football clubs and their players. Components A – C were used to identify and provide evidence for the risk compensation model. This evidence was discussed to identify the balancing behaviour component of the risk compensation model (part D of the thesis). Sections A and B represent the short-term and long-term consequences. To complete the modelling process, previous literature was also used to obtain measures of propensity to take risk and perceived risk within each confounding factor.
Table 1.3. Components of the thesis design based on the risk compensation theory

<table>
<thead>
<tr>
<th>Thesis component</th>
<th>Professional football clubs</th>
<th>Professional footballers</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Balancing behaviour</td>
<td>Parts A – C of the thesis design led to the application of Chapters 2 to 6 to the risk compensation model for football clubs and their players (Ch7).</td>
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</table>
Chapter 1 identified that the 'risk estimation' processes used in English professional football had provided detailed epidemiological data on the aetiology and frequency of injury. Following on from this, the first part of this thesis evaluates the impact of the players' injuries to their employers, the football clubs. This process requires a cost-benefit analysis of a range of control strategies that could be implemented to reduce and control the injury risk. As a precursor to this cost-benefit analysis, an economic model is required to describe the relationships between playing and financial performance.

The risk management approach has been advocated in professional football (Fuller, 1998b) to reduce the levels of risk, and to comply with UK health and safety legislation. Compliance with these regulations would enable the professional football industry to fulfil all legal requirements with regards to players' health and safety (Fuller, 1995). The non-availability of players through injury is a major risk in professional football because of the consequential effects on clubs' playing and financial performances. As the first step in a programme to demonstrate the utility of the risk management approach, Hawkins and Fuller (1999) established a database, which identified the aetiology and probability of injury to players in English professional football. This risk assessment indicated that the overall level of injury to professional footballers was approximately 1000 times higher than occupations that were generally regarded as high risk, e.g. coal mining and construction (Hawkins and Fuller, 1999).

The second stage of this risk programme, which involves a cost-benefit analysis of potential risk control strategies, requires an economic model in order to analyse the financial impact of players' injuries. There is a dearth of research work which has assessed the cost impact of injury within professional sport. Tolpin and Bentkover (1981) have described the direct and indirect costs associated with amateur sports injuries together with their social costs. Ekstrand (1982) has also assessed the cost of injury in the lower divisions of Swedish professional football. However, although both studies discussed the costs associated with treatment and rehabilitation of injuries, they did not assess the impact of the players' injuries on the club's playing and financial performance. With the growth in medical technology and advances and in the financial status of the English football industry in the past decade, the injury consequences need to be
A club must perform profitably if it wants to survive in the highly competitive world of professional sport (Stewart et al, 1999). However, the majority of previous literature on the economics of professional sport has concentrated on the theoretical and empirical economic evidence related to the supply and demand aspects of team sports and the objectives of clubs (Bird, 1982; Cairns et al, 1986; Dobson and Goddard, 1995). In football, as with other team sports, the financial performance of any one team is dependent, to some extent, on the success of the overall league. The league structure, which provides the competitive environment, must attract sufficient revenue in order to sustain the economic viability of all participants. Whilst the development of, for example, the extended European Champions League and the World Club Championship has made club football, at the highest level, more international, the economic viability of individual clubs is still dependent on the success of their national league. This competitive balance and the outcome uncertainty is the key to economic success of professional team sports (Sloane, 1971).

In determining the market objectives of professional football clubs, Sloane (1971) analysed cross-subsidisation, market structures and considered four general models. These models were discussed under the headings of profit maximisation, long-run survival, attendance maximisation and utility maximisation, in order to describe clubs’ behaviours within the English football league structure. The conclusion was that a model based on utility, which included playing success, spectator attendance, profits and the health of the league, was better than one based on profit alone. With profits, an important consideration for the health of the football industry, Dobson and Goddard (1998) discussed factors that affected the generation and distribution of revenues in English league football for the period 1927 to 1994. They concluded that the distribution of total revenue had become more unequal since 1990 with less cross-subsidisation between clubs, although, the absolute level of revenue generated had increased dramatically for all clubs.

The aims of this chapter are to demonstrate a relationship between revenue and performance, in order to construct an economic model, which could be used with a risk management framework. Relationships have been demonstrated, in English professional football, between league performance / financial profit and league performance / club wage, for 48 clubs over the period 1974 to 1989 (Szymanski and Smith, 1997) and for 77 clubs over the period 1946 to 1994 (Dobson and Goddard, 1998). These reports used annual final league placing to indicate team playing performance, and crowd attendance or gate receipts to indicate financial performance of each club. However, none of these models accommodated or described the impact of players'
injuries on either the playing performance or the financial performance of football clubs. Whilst the theoretical basis of the economic issues in professional football is important, this aspect was not addressed in the present study. It was the presence of empirical equilibrium relationships, per se, between financial and playing performance and the consequences of perturbations from these equilibria, caused by exogenous variables that were of interest. The aim of this study was therefore to develop an empirical, risk management framework model, which could be used to analyse the impact of injuries to players on both team playing performance and club financial performance.
2.2 METHOD

All performance data refer to clubs playing in the English FA Premier League and Divisions 1, 2, and 3 of the Football League during the seasons 1993/94 to 1997/98.

2.2.1 Team-quality

The quality of each player was determined firstly by the player’s international status, using the categories of non-international, under-21 international, and full international (Hugman, 1998; Rollin and Rollin, 1995 to 1999), and secondly by the FIFA (1999) ranking of their national team. For each season j, each player p in team i was assigned a player-quality score \( (Q_i^p) \). This score was zero for a non-international player; equal to 50% of the end of season (May) FIFA ranking of the player’s national team for a U-21 international player; or equal to the end of season (May) FIFA ranking of the player’s national team for a full international player. For each team i, an actual team-quality score \( (Q_i) \) was determined, for each season j, from the sum of the individual player-quality scores \( (Q_i^p) \) for players \( p = 1 \) to the number of players in the playing squad:

\[
Q_i = \sum Q_i^p
\]

A relative team-quality score \( (RQ_i) \) was defined, for team i, in each season j:

\[
RQ_i = Q_i / Q_A
\]

Where \( Q_A \) represents the average actual team-quality score for all teams in season j. An average relative team-quality score \( (\bar{RQ}_i) \) was determined, for team i, for the seasons 1993/94 to 1997/98, where \( j = 1 \) to 5:

\[
\bar{RQ}_i = \{ \sum RQ_i \} / 5
\]

2.2.2 Team-performance

Final league placing for each team was obtained from the Rothmans Football Yearbooks (Rollin and Rollin, 1995 to 1999) for the seasons 1993/94 to 1997/98. The equation advocated by Szymanski and Smith (1997) for describing the relative team-performance \( (RP_i) \) of team i, in season j, was adopted:
\[ iRP_i = \frac{jP_i}{(93 - jP_i)} \]

Where, \( jP_i \) represents the final league position for club \( i \), in season \( j \), with league position defined on a scale from 1 (first in the Premier League) to 92 (last in Division 3). An average relative team-performance score \( ^\Delta RP_i \) for team \( i \) was determined for the seasons 1993/94 to 1997/98, where \( j = 1 \) to 5:

\[ ^\Delta RP_i = \frac{\sum iRP_i}{5} \]

### 2.2.3 Club-salaries

Declared club-salaries for each club were obtained from the Deloitte & Touche (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996;) financial reports on English professional football for the seasons 1993/94 to 1997/98. The equation advocated by Szymanski and Smith (1997) for describing relative club-salaries was adopted:

\[ iRS_i = \frac{jS_i}{jSA} \]

Where, \( iRS_i \) represents the relative club-salary for club \( i \) in season \( j \); \( jS_i \) represents the actual club-salary for club \( i \) in season \( j \); and \( jSA \) represents the average club-salary for all clubs in season \( j \). An average relative club-salary \( (^\Delta RS_i) \) for club \( i \) was determined for the seasons 1993/94 to 1997/98, where \( j = 1 \) to 5:

\[ ^\Delta RS_i = \frac{\sum iRS_i}{5} \]

### 2.2.4 Club-turnover

Declared club-turnovers at each club were obtained from the Deloitte & Touche (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996;) financial reports on English professional football for the seasons 1993/94 to 1997/98. A similar approach to the one used for relative club-salaries was adopted for calculating relative club-turnovers:

\[ iRT_i = \frac{jT_i}{jTA} \]

Where, \( iRT_i \) represents the relative club-turnover for club \( i \) in season \( j \); \( jT_i \) represents the actual club-turnover for club \( i \) in season \( j \); and \( jTA \) represents the average club-turnover for all clubs in season \( j \). An average relative club-turnover \( (^\Delta RT_i) \) for club \( i \) was determined for the seasons
1993/94 to 1997/98, where \( j = 1 \) to 5:

\[
^\wedge RT_i = \left\{ \sum jRT_i \right\} / 5
\]

2.2.5 Statistical tests

Linear regression and correlation (Pearson correlation coefficient (r)) were assessed within the Statistical Package for Social Science (SPSS; v. 9.0). Significance was accepted at the 0.05 level unless stated otherwise in the text.
2.3 RESULTS

2.3.1 Team-quality, team-performance, club-salary and club-turnover

Ninety-three teams participated within the league structure over the period 1993/94 to 1997/98 but data for the two teams (Hereford and Macclesfield) that were not present for the full five year period were excluded from the analysis. However, because data were not published for club-turnover and club-salary, for all clubs in each of the five seasons, the numbers of data points available for these parameters were 80 and 87, respectively. The average relative team-quality, team-performance, club-salary and club-turnover values, for the seasons 1993/94 to 1997/98, are shown for each team in Table 2.1.
Table 2.1. Average relative values of team-quality, team-performance, club-salary, and club-turnover for seasons 1993/94 to 1997/98.

<table>
<thead>
<tr>
<th>Team</th>
<th>Relative Team-quality; $\Delta RQ_i$</th>
<th>Relative Team-performance; $\Delta RP_i$</th>
<th>Relative Club-salary; $\Delta RS_i$</th>
<th>Relative Club-turnover; $\Delta RT_i$</th>
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<td>0.109</td>
<td>2.299</td>
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<tr>
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<td>0.231</td>
<td>5.182</td>
<td>-</td>
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<td>0.489</td>
<td>0.738</td>
<td>0.554</td>
</tr>
<tr>
<td>Walsall</td>
<td>0.684</td>
<td>2.929</td>
<td>0.322</td>
<td>0.342</td>
</tr>
<tr>
<td>Watford</td>
<td>0.943</td>
<td>0.924</td>
<td>0.694</td>
<td>0.485</td>
</tr>
<tr>
<td>West Bromwich</td>
<td>0.975</td>
<td>0.651</td>
<td>0.733</td>
<td>0.842</td>
</tr>
<tr>
<td>West Ham</td>
<td>2.191</td>
<td>0.146</td>
<td>1.786</td>
<td>2.115</td>
</tr>
<tr>
<td>Wigan</td>
<td>0.343</td>
<td>8.221</td>
<td>0.303</td>
<td>0.109</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>1.552</td>
<td>0.128</td>
<td>1.365</td>
<td>1.285</td>
</tr>
<tr>
<td>Wolves</td>
<td>1.921</td>
<td>0.480</td>
<td>1.567</td>
<td>1.433</td>
</tr>
<tr>
<td>Wrexham</td>
<td>0.516</td>
<td>1.429</td>
<td>0.282</td>
<td>0.233</td>
</tr>
<tr>
<td>Wycombe</td>
<td>0.343</td>
<td>2.067</td>
<td>0.479</td>
<td>0.414</td>
</tr>
<tr>
<td>York</td>
<td>0.017</td>
<td>1.779</td>
<td>0.246</td>
<td>0.173</td>
</tr>
</tbody>
</table>

The variation in average quality of the players in teams in each division was calculated by sorting the player-quality scores of players in rank order, for each team, and averaging the player-quality scores for each rank position, in each division, Figure 2.1.
Figure 2.1. The average quality of players, in rank order, and by Division for seasons 1993/94 to 1997/98.

Figures 2.2 to 2.5 show the empirical relationships obtained for (i) team-quality / team-performance; (ii) club-turnover / team-performance; (iii) club-turnover / club-salary; and (iv) team-quality / club-salary, respectively.
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Figure 2.2. The relationship between team-quality and team-performance for seasons 1993/94 to 1997/98.

Figure 2.3. The relationship between club-turnover and team-performance for seasons 1993/94 to 1997/98.
Chapter 2: Risk management framework model

Figure 2.4. The relationship between club-turnover and club-salary for seasons 1993/94 to 1997/98.

Figure 2.5. The relationship between team-quality and club-salary for seasons 1993/94 to 1997/98.
Log-log transformations were used to present the data in Figures 2 to 5 in order to accommodate the range of values in the parameters and in order to induce linearity into the relationships. The empirical relationships were assessed on the assumption of a linear correlation, of the type \( \log(y) = m \cdot \log(x) + c \). Significant \((p<0.001)\) correlations \((r)\) were obtained for the four pairs of data, Table 2.2.

Table 2.2. Linear regression constants and correlations for the relationships shown in Figs. 2.2 to 2.5.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Slope; (m)</th>
<th>Intercept; (c)</th>
<th>Coeff. of det. ((r^2))</th>
<th>SE of estimates</th>
<th>t - ratio</th>
<th>p - ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team-quality /</td>
<td>0.480</td>
<td>- 0.130</td>
<td>0.74</td>
<td>0.27</td>
<td>(t = 12.48)</td>
<td>(p &lt; 0.001)</td>
</tr>
<tr>
<td>Team-performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club-turnover /</td>
<td>0.650</td>
<td>- 0.260</td>
<td>0.86</td>
<td>0.17</td>
<td>(t = 22.75)</td>
<td>(p &lt; 0.001)</td>
</tr>
<tr>
<td>Team-performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club-turnover /</td>
<td>1.170</td>
<td>- 0.040</td>
<td>0.96</td>
<td>0.10</td>
<td>(t = 37.09)</td>
<td>(p &lt; 0.001)</td>
</tr>
<tr>
<td>Club-salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team-quality /</td>
<td>0.982</td>
<td>0.036</td>
<td>0.88</td>
<td>0.20</td>
<td>(t = 17.13)</td>
<td>(p &lt; 0.001)</td>
</tr>
<tr>
<td>Club-salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.4 DISCUSSION

Football clubs employ players with a range of skills through a system of quality-adjusted salaries; the sum of these football skills determines the potential team-performance of the club within the league structure. Team-performance partly determines the club's total financial turnover, which then controls the level of club-salary available for recruiting and employing players. This empirical model incorporates the four key parameters of team-quality, team-performance, club-salary and club-turnover.

2.4.1. Team-quality

In most economic models, a distinction is not made between team-quality and team-performance (Cairns et al., 1986). Reference is frequently made to 'clubs buying success'; in reality, clubs can only buy players, who together form a team with the potential to achieve a proportionate level of success. Team-quality therefore provides the essential link between a club's salary expenditure on players and the team's playing performance. In defining player-quality, it is important to use an independent, definable and overt measure, otherwise the measure could be considered to be subjective. Some parameters, such as goals-scored, goals-conceded, number of successful tackles and number of successful passes, can be used to define player-quality. However, it is impossible to obtain comprehensive and reliable data for all players in all teams and to compare the relative performances for forwards, midfielders, defenders and goalkeepers. Previously, transfer values (Szymanski and Smith, 1997) have been proposed as a potential means of defining player-quality. This proposal was based on the assumption that, in a free market, clubs would bid against each other for players and the simple economic principle of supply and demand should ensure that the highest quality players would attract the highest transfer fees. However, the Bosman ruling, which enabled freedom of movement for players at the end of their contracts, has in many cases eliminated transfer fees when players move between clubs. The use of transfer values also would not enable the quality of players that have been developed and retained within a club to be taken into account. In addition, if a club pays a high transfer fee for a player, they would almost certainly pay the player an equivalent high salary, which would induce a self-fulfilling correlation between player-quality and club-salary levels. In professional rugby league, Carmichael and Thomas (1995) attempted to define the performance input of various clubs by defining variables for the various factors of strength, experience, player ability, team organisation and coaching experience. However, the criteria used to define these variables are not clear and in some cases incorrectly defined, e.g. strength (height and weight) is inconsistent with the physiological definition of strength. In county cricket, Schofield (1988) recognised the difficulty in
quantifying the performance influencing factors of ability, form, experience, availability, and training facility quality to determine aspects of performance. To overcome these issues within the present study, an alternative definition of player quality and skill was used.

It is generally accepted, in all sports, that selection to play for one's national team is recognition of a player's quality because a national team-manager has the single objective of creating the best possible team from all the players available. Most importantly, national team managers are normally considered to be amongst the best judges of players' abilities and they are not hindered in their team selections by financial constraints. However, selection for a national team, per se, is not a valid measure of player-quality because national teams themselves are not all of the same quality and this is reflected in the FIFA ranking scores assigned to each national team. These rankings are derived from an internationally recognised scoring system (FIFA, 1999), which is based on the results achieved by each national team. Therefore, national teams that achieve the best performances receive the highest FIFA ranking scores and these reflect the quality of the players within those teams. In this study, the number, international status and FIFA ranking scores of countries, for players within each club's playing squad, defined the overall team-quality scores. It was recognised that this approach had limitations and would not differentiate, for example, between:

- quality of individual players within a national team;
- experience and number of international appearances;
- contributions by players in different playing positions;
- quality of non-international players; and
- quality of coaches and other support staff

The FIFA ranking system, designed by Dr. Markus Lamprecht and Dr. Hanspeter Stamm, has been criticised by the Recreational Sport Soccer Statistics Foundation (RSSSF) for its method of calculating the ranking score (http://www.risc.uni-linz.ac.at/misc-info/rsssf/nersssf.html). Several contributors to the statistics database have provided alternative methods of calculating a rank score that they believe is far superior to the FIFA method. Some of these criticisms aimed at the FIFA ranking system include, for example:

- The system only includes A level games, with no consideration to B, U21, women's etc.
- The ranking system considers the previous eight years results in the final rank score. Current form in the previous twelve months is of most importance to the rank
score and previous results should have a minimal influence to the current ranking.

- Regional strengths are factored into the total rank score, with teams playing against another from the same continent having the same factor assigned. This would mean that Brazil vs. Venezuela is worth the same, factor wise, as Italy vs. Germany. A match such as Ghana vs. Nigeria is worth less than England vs. the Faroe Islands.

- Only goals scored in normal and extra time are considered. It would be more appropriate if goals scored and conceded were normalised according to the total exposure time.

Although these criticisms are valid in some cases they do not all apply to the present chapter objectives. Some of the FIFA representatives do not have B, women’s or U21 sides and this would lead to additional calculation factors. Many of the players given a rank score have also played international football for more than one year, therefore the FIFA rank score provides a measure of previous performance in each player’s overall rank score. In general however, the marginal differences between these factors were considered small compared to the marginal differences in quality between players from different national teams and between full international, under 21 international and non-international players. Many Division 1, 2, and 3 clubs employed U-21 international, past international, and/or current international players from countries outside the elite group of international teams and this was sufficient to provide quality differentials for all but two teams, Figure 2.1 and Table 2.1. Most importantly, this approach provided a measure of player-quality that was independent of salary and team-performance within the English League. The assumption that team performance is the linear summation of individual performance with players’ contribution separable from their colleagues has previously been recognised in the model developed by Scully (1974).

From Figure 2.1, it is possible to calculate changes in team-quality as a result of loss of players through suspension or injury. It can be assumed that if no players are absent the maximum team-quality ($P_{i}^{\text{max}}$) will be the total quality score of the first eleven ranked players ($P_{1}^{(p=1 \text{ to } 11)}$), i.e.

$$P_{i}^{\text{max}} = \sum P_{(p=1 \text{ to } 11)}$$

If a player is unavailable through suspension or injury, the new team-quality score ($P_{i}$) will be the difference between $P_{i}^{\text{max}}$ and the difference between the quality score of the replacement player/s ($P_{\text{rep}}^{(p=1 \text{ to } n)}$) and the absent player/s ($P_{\text{ab}}^{(p=1 \text{ to } n)}$), i.e.
Chapter 2. Risk management framework model

\[ P_i = \left( P_i^{\text{max}} - (P_{ab}^{(p=1 \text{ to } n)} - P_{rep}^{(p=1 \text{ to } n)}) \right) \]

This can be represented as a relative proportion of maximum team quality, i.e.

\[ P \% = \left( \frac{P_i}{P_i^{\text{max}}} \right) \times 100 \%

The decrease in team-quality through player absence, Figure 2.6, is based on the assumption that the 1st ranked player is replaced by the 12th ranked player, 2nd ranked player is replaced by the 13th ranked player, etc. In the majority of situations, it would be unlikely that this player absence and replacement scenario would be encountered. However, Figure 2.6 does show that the relative loss in team-quality for Premier League clubs is less when compared to lower division clubs.

![Figure 2.6. The relative loss in team-quality through player absence](image)

A relative team-quality score was employed to reflect the importance of comparative quality rather than absolute quality as the defining factor in match results between teams. The use of relative team-quality scores also accommodated the increasing absolute level of quality available within the English leagues that was brought about by the increasing number of overseas international players employed across all divisions over the five seasons. For example, in the Premier League the number of non-UK players increased from 11 in 1992 to over 200 in 1999 (Curry, 1999). These players were invariably international players of high quality from countries all round the world.
2.4.2 Team-performance

Criteria used for measuring team-performance usually relate to team results in cup and/or league competitions. Whilst cup competitions do provide an equal opportunity for all teams to win, they do not provide a continuous performance measure across all divisions. The use of league position has some limitations because there are barriers to free movement between divisions imposed by the relegation and promotion system. However, league performance provides a more consistent measure of home and away performance, against peer group teams over a full season, than that provided by one-off match results in cup competitions. The end of season league position was therefore used as the measure of team-performance and the expression \( \text{league position}/(93 - \text{league position}) \) proposed by Szymanski and Smith (1997) was adopted in order to provide a measure of relative performance.

2.4.3 Club-salary

Information on individual players' salaries was not available from clubs. Therefore the same assumption as that used by Szymanski and Smith (1997) and Dobson and Goddard (1998a) with respect to team salaries was made; viz. team-salaries represent a substantial part of the total club-salary bill and club-salaries proportionately equate to players' salaries. This assumption was supported by the financial reports on clubs' performances published by Deloitte & Touche (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996). Money available within a club for players' salaries, which represents the budget constraint, and the price / quality ratio for players determine the trade-off decision between the overall number and the quality of players that can be employed by each club. The assumption is made that, across the whole league, a unit of salary purchases a similar unit of playing quality for every team (Szymanski and Smith, 1997). This is a reasonable assumption because players' salaries are negotiated, in an open market, through players' own agents or with the assistance of the Professional Footballers' Association. As the average club-salary increased from £2.4M in the 1993/94 season to £5.8M in the 1997/98 season, relative club-salaries were used in order to take into account these inflationary factors over the five seasons (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996).

2.4.4 Club-turnover

Previous authors have used spectator attendance (Davies et al, 1995), gate revenue (Dobson and Goddard, 1998a) and club profit (Szymanski and Smith, 1997) as financial performance indicators. However, club finances, which support players' salaries, now accrue from a much wider range of sources; notably, match-day (40%), television (24%) and other commercial...
(36%) income streams (Boon et al, 1999). These sources of income have therefore changed the financial basis of most clubs and those of the Premier League clubs in particular (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996). For this reason, total club-turnover was used as a measure of each club’s financial performance because, whilst turnover does not equate to profit, it does equate to the resource available for financing players’ salaries. As average club-turnovers increased from £4.5M in 1993/94 to £9.6M in 1997/98, relative club-turnovers were used in order to take into account these inflationary factors over the five seasons (Barton et al, 1997; 1998; Boon et al, 1995; 1999; Thorpe et al, 1996).

2.4.5. Management framework model

The four empirical relationships, which are presented in Figures 2.2 to 2.5, exhibited high (r = 0.70 to 0.90) or very high (r = 0.90 to 1.00) (Cohen and Holliday, 1998) correlation coefficients, Table 2.2. When these relationships are combined, they define the inter-dependencies of team-quality, team-performance, club-salary and club-turnover and form the basis of the management framework model shown in Figure 2.7.
Chapter 2: Risk management framework model

Figure 2.7. Management framework model illustrating the inter-dependence of relative club-salary, team-quality, team-performance and club-turnover.

The model shows that a club with a relative club-salary resource level of $CS_1$ can employ players of sufficient quality to produce a relative team-quality of $TQ_1$. A team with this relative quality should achieve a relative team-performance equivalent to $TP_1$ that should then generate a relative club-turnover equal to $CT_1$, which would be capable of maintaining the relative club-salary of $CS_1$. A significant positive change in the value of a club’s relative team-quality, $TQ_2$, brought about for example by an injection of funds equal to $CS_2 - CS_1$ would be expected to produce short-term improvements in team-performance, $TP_2$, e.g. Blackburn Rovers and Jack Walker. However, increases in club-turnover, e.g. from television and participation in European competitions, often lag behind team success because these revenue streams are not fully established until one or more years after the improvement in team performance. Therefore, the club-turnover would remain at $CT_1$ in the short-term, and a continuous injection of funds into the club-salary resources would be required in order to maintain $CS_2$ until the improved team-performance had increased club-turnover to a level that could support the higher club-salary.
level. An increase, therefore, in the equilibrium value for any parameter must be supported by medium and long-term changes in the other three parameters, otherwise the new position will not stabilise and there will be regression to the existing equilibrium value of the parameter. Although these changes do not necessarily occur immediately - for example, there is some evidence of team-performance following a lagged dependence on revenue (Dobson and Goddard, 1998b) - the changes must occur within a time-frame that allows the new equilibrium position to be maintained and become self-sustained. The problem that most clubs face is the need for immediate success to appease their fan support, but it is evident that for continued success and growth to be experienced a continued financial windfall is required.

Whilst much is made in the media of the large financial contribution made by television income (24%), match day income (40%), at nearly twice this level, remains the major source of revenue for football clubs (Boon et al, 1999). This highlights two important issues for clubs with ambitions of moving to a higher relative team-performance. First, the club must operate in an environment where the local population is sufficient to generate and maintain the required club-turnover, through match attendance and other revenue streams, e.g. merchandising. Second, the club stadium must have sufficient capacity and facilities to accommodate the number of spectators required. If these criteria were not satisfied, the club would eventually have to reduce the club-salary to a level that was commensurate with the sustainable level of club-turnover. The team-quality would therefore return to its previous level as the higher quality players transferred to other clubs, where they could maintain their quality adjusted salary levels. Without a major benefactor therefore, many professional clubs will continue to approximate to their typical league position whilst their supporters continue to dream of Premier League status and the rewards it brings.

2.4.6 Financial demands of improving team performance

The club-turnovers at 1997/98 values, derived from the relationship shown in Figure 2.3 and Table 2.2, required to maintain a given league position are shown in Figure 2.8. This enables the additional club-turnover, which must be generated in order to sustain an improved team-performance to be determined.
Figure 2.8. Club-turnovers (1997/98 values) required to maintain defined league positions.

For example, to move from the mid-point of the Third Division (80th) to the Second Division (56th) requires an additional £2.4M, from the Second Division (56th) to the First Division (32nd) an additional £4.1M, and from the First Division (32nd) to the Premier League (10th) an additional £12.9M. In practice, therefore, moderate long-term improvements in team-performance, for Second and Third Division clubs, are easier to sustain because the absolute changes required in club-turnover are relatively small. However, in order to improve team-performance from a mid-table First Division club to a mid-table Premier League club would require a substantial absolute change in club-turnover to sustain this level of team-performance. Leicester City and Derby County, who were promoted from the First Division at the end of the 1995/96 season and have sustained their Premier League status since then, have increased their club-turnover significantly. Leicester City’s turnover increased from £9.3M in 1995/96 to £17.3M in 1996/97 and £19.2M in 1997/98, whilst Derby County’s increased from £4.5M in 1995/96 to £10.7M in 1996/97 and £20.1M in 1997/98 (Boon et al, 1999).

The management framework model, Figure 2.7, has many applications within the professional football industry. Within the Scottish Football league structure, the national competitions tend to be dominated by Glasgow Rangers and Glasgow Celtic. In response to this domination, there has often been talk of these two clubs competing within the English league structure. This model would enable the clubs to obtain an idea of how they would perform in terms of playing and financial performance based on their current team-quality. It also follows that clubs from
other European countries could evaluate how they may perform within this structure and to evaluate the potential difference in club-turnover compared to their performance in their respective leagues. In the present chapter, the management framework model has provided the means to enable a cost benefit analysis to be used for the evaluation of all new investments. The primary goal of a football club is to improve both playing and financial performance and this can only be achieved by improving team-quality or ensuring that the maximum team-quality potential, Figure 2.6, is not reduced for competitive matches. If player absence rates are reduced with appropriate investment, relative to other teams, the resulting playing and financial performance could be as effective as the purchase of a new player. This model will enable a cost benefit analysis of these options, which both provide improvements in team-quality.

The model also has implications for the management of Football League clubs. First division clubs currently incur the greatest pre-tax losses (Boon et al, 1999) in their quest for Premier League status and the riches that it can bring. By spending the majority of their income on transfers, in the hope of a return when they achieve Premier League status, their published accounts often report substantial losses. Only a few clubs with an extensive support base and stadium can actually support the financial demands of successfully competing in the Premier League. For clubs that do not have the stadium and support base to support the demands of the Premier League, it is important they set themselves realistic goals to prevent financial ruin. The most recent example of a failure to do this is Crystal Palace, whose desire to reach the Premier League led to debts approaching £20M (Summary Staff, 2000b).

However, to produce an accurate and comprehensive cost benefit analysis of methods to improve team-quality, it is important that data are available in an appropriate format. There already exist comprehensive transfer data in the English football industry through Rothmans Football Yearbooks (Rollin 1994; Rollin and Rollin 1995; Rollin and Rollin 1996; Rollin and Rollin 1997; Rollin and Rollin 1998). There is also comprehensive injury epidemiology available for the English leagues (Lewin 1989; McGregor and Rae 1995; Hawkins and Fuller 1999) but these data are not in a format suitable to illustrate the injury risk to professional football clubs. The aim of the following chapter is to demonstrate how injury risk based data can be used in the construction of a cost benefit analysis for management investment decisions.
2.5 STRENGTHS AND WEAKNESSES

The development of the risk management framework for professional football is based on data from a number of secondary sources representing the actual financial and playing performance in the English football industry. Other studies have attempted to model some of the variables used in the present study but there has been little work that has addressed the variable of 'quality' and attempted to integrate this parameter with team-performance, club-salary, and club-turnover. All of the inter-dependent relationships that were produced exhibited a high or very high correlation, and concomitantly a high coefficient of determination between the corresponding variables. This indicates that each linear and proportional relationship, illustrated in Figures 2.2 to 2.5, is highly dependent on the others and provides an accurate measure of prediction for the population concerned. The potential applications for the use of the model are numerous, although the model is principally designed to assess injury risk and the impact on the financial and playing performance of football clubs.

The weakness of the model specifically relates to the definition of 'team-quality', which accounted for 74% of the variance in the team performance indicator. The quality measure was dependent on FIFA ranking scores, which have themselves been criticised for their non-applicability to current international performance of each team. However, the correlation coefficients and therefore the coefficients of determination for team-quality when related to team-performance and club-salary were high to very high, justifying the selection of the methods used to describe team-quality. The validity of the data would be improved if data from a greater number of seasons were used in the modelling process. However, the FIFA ranking scores are only available from the 1993/94 season. Furthermore, accurate financial data for the English football industry have only been available in a collective format since 1991/92, and club-salary data have only been available since 1993/94 from the Deloitte & Touche Annual Reviews of Football Finance.
CHAPTER THREE

THE RISKS OF INJURY TO PROFESSIONAL FOOTBALL CLUBS AND THEIR PLAYERS

3.1 INTRODUCTION

In Chapter 2, an economic management framework model was developed to evaluate the consequences of player injury for professional football clubs. This model was developed on the premise that all clubs have a similar injury risk. The risk of an injury to a sports participant has traditionally been expressed as an injury frequency rate (IFR) or as a frequency distribution. An IFR is the likelihood of an injury occurring per unit of exposure; typical exposure periods used are 1000, 10,000 or 100,000 hours (Weightman and Browne, 1975; Ekstrand and Gillquist, 1983a; Schmidt-Olsen et al, 1985; Hawkins and Fuller, 1999). In English professional football, the IFR is approximately 8.5 per 1000 hours of exposure (Hawkins and Fuller, 1999). Injury frequency rates however, do not describe the risk to either players or their clubs, but merely the probability that an injury of some type will occur. Risk is a function of both the probability (expressed as IFR in this case) and the consequences or severity of the injury occurring (Royal Society, 1992). Therefore, for a more accurate representation of the risks to players and their clubs, measures of both injury severity and the probability of that injury occurring must be included. Injury severity and consequence can be defined in terms of the nature of an injury, the duration and nature of injury treatment and rehabilitation, quantity of permanent damage, or monetary costs (van Mechelen, 1997).

Most professional football clubs face financial constraints (Boon et al, 1999), which determine the quantity of investment that can be allocated to the health and safety of their players. As such, it is essential that clubs allocate these resources in the most effective manner and in a method that will provide the best return from this investment. This return can be most effectively assessed through the process of cost benefit analysis by using the economic management framework developed in Chapter 2. The first part of this process requires an accurate definition of injury risk and the aetiological factors that account for the injury risk. A risk manager can then use this to evaluate the levels of risks in order to define cost efficient solutions to reduce the risks to the population concerned.

The aim of this chapter is to demonstrate how risk based data can be used to construct a framework for cost benefit analysis for management investment decisions on injury prevention, treatment and rehabilitation. The risk data will also be applied to the economic...
management framework outlined in Chapter 2 to illustrate the potential influence of injury risk on team-performance and club-turnover.
3.2 METHOD

3.2.1. Data collection procedure

Player injuries were prospectively recorded over the period November 1994 to May 1997 at four English professional football clubs. All professional players at these clubs were included in the study together with youth players from two of the clubs. Each injury was diagnosed by the clubs' senior physiotherapists, who were qualified to either Chartered status or FA Diploma level. The senior physiotherapist at each of the four clubs recorded their injury data on a specific injury report form designed for this study.

The data, recorded for each injury, included information related to the date and place of occurrence, player identification, type of activity, injury description and extrinsic playing factors. A recordable injury was defined as one received during competition or training and which prevented the injured player from participating in competition or normal training for at least one day, not including the day of the injury. Absence arising from sickness or other general medical conditions, which required examination by a player's own general practitioner, was not included in the study. The severity of each injury was defined by the length of time that a player was absent from training or competition: *slight* - 1 to 3 days; *minor* - 4 to 7 days; *moderate* - 1 to 4 weeks; and *major* - greater than 4 weeks. The specific days when players were unavailable through injury were recorded by the physiotherapist on a separate log sheet. The categories designated as 'minor', 'moderate' and 'major' correspond to injuries that are reportable in the UK under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) (HMSO, 1995). A detailed description of the data collection procedure has been reported previously (Hawkins and Fuller 1999).

3.2.2. Financial and playing performance data

All performance data refer to clubs playing in the English FA Premier League and Divisions 1,2 and 3 of the Football League during the season 1997/98 (Boon et al, 1999).

3.2.3 UK industry statistics

Statistics from the Health and Safety Executive (HSE) (1994) publication 'The costs to the British Economy of Work Accidents and Work-related Health' (Davies and Teasdale 1994) and the Health and Safety Commission accident statistics for 1997/98 (Health and Safety
Chapter 3: Risks of injury to professional football clubs

Commission, 1998) were used to calculate the average absence rate for UK industry employees. To calculate the number of UK working employees included in the HSE statistics, the number of reported accidents was divided by the accident frequency rate. The accident frequency rate in the HSE statistics is reported per 100,000 employees. The average number of days absent per employee during the year 1997/98 was calculated by dividing the total number of days lost by the total number of employees.

3.2.4 Statistical analysis

During the study, players were assigned unique code numbers so that their identity was known only to their own physiotherapists. Data were stored and analysed using the computer-based software SPSS (Chicago, Illinois) version 9.0.

A one-way ANOVA model was used to test for differences for the dependent factor of days of absence from play for the independent factors of injury severity (4 levels); injury location (10 levels); injury nature (12 levels); and, injury mechanism (11 levels). When the Levene test for homogeneity of variance was significant for a one way ANOVA model, the Kruskal Wallis H test for three or more unrelated samples was used. It would have been preferable to test the data using a factorial ANOVA model as this method provides a more sensitive or powerful statistical test of the effect of the factors (Bryman and Cramer, 1999). However, when using a factorial ANOVA model there were zero or small sample sizes within certain categories. There is an increased risk of a type I error by using a one-way ANOVA model and the results must be considered in this light. Post hoc Tukey tests were also carried out to identify where specific differences were located, except for one group where there was only one case.

A t-test for independent data was used to test the difference in days according to thigh injury location. Chi - Square was used to assess independence in categorical data. Statistical significance was accepted at the 95% confidence level, unless stated otherwise.
3.3 RESULTS

3.3.1. Overview

The injury database covered 138 players and included 744 reports of injury that prevented a player from training or competing for at least one day; a detailed analysis of this information has been presented previously (Hawkins and Fuller, 1999). The data showed that, each season during competition and training, between 86% and 100% of all players received an injury that resulted in time absent from their club. The overall IFR for players was reported to be 8.5 injuries per 1,000 player-hours of competition and training. Of the 744 injuries reported, 587 injury-reports (76%) provided precise information on the number of days absence from training and competition. These injuries accounted for a total of 8,644 days of absence, which equated to an average absence period of 14.7 ± 22.5 days per injury. Assuming a six week close season, the seasonal absence rate for players was equivalent to 39.6 days per player or 13% of the playing season.

3.3.2. Injury frequency and severity

The frequency of injuries was proportioned as 16.9% (slight), 34.4% (minor), 37.1% (moderate) and 11.6% (major) ($\chi^2 = 484.2, p < 0.001$). The total number of days of absence, average number of days of absence per injury and IFR per 1000 hrs as a function of injury severity are summarised in Table 3.1. There was a significant difference in the number of days absent as a function of injury severity ($F_{3,600} = 205.7, p < 0.001$).

<table>
<thead>
<tr>
<th>Severity</th>
<th>Injury frequency rate / 1000 hrs</th>
<th>Av. no. days of absence / injury</th>
<th>% of total absence from injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>1.4</td>
<td>2.7 (1.1)</td>
<td>2.7</td>
</tr>
<tr>
<td>Minor</td>
<td>3.0</td>
<td>6.0 (4.0)</td>
<td>14.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.2</td>
<td>13.8 (6.0)</td>
<td>35.4</td>
</tr>
<tr>
<td>Major</td>
<td>0.9</td>
<td>55.7 (43.3)</td>
<td>47.4</td>
</tr>
<tr>
<td>Total</td>
<td>8.5</td>
<td>14.6 (22.5)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The frequency distributions for days of absence for all new and re-injuries are shown in Figure 3.1 (up to 8 weeks).
Figure 3.1. Frequency distribution for the days of absence due to injury

The data shown in Figure 3.1 have also been displayed as percentage cumulative frequency and cumulative risk distributions, Figure 3.2. Here, risk is defined as the number of injuries by the number of days absent multiplied by the number of injuries resulting in the defined number of days absence.
3.3.3. Injury location

The average numbers of days of absence from competitive play and training for the five main injury locations were not significantly different (groin: 15.8 ± 16.6; thigh: 12.3 ± 16.8; knee: 20.9 ± 36.1; lower leg: 15.6 ± 25.3; ankle: 13.1 ± 13.0). The groin (10.9%), thigh (18.5%), knee (22.3%), lower leg (13.4%) and ankle (15.1%) also accounted for the majority of the days of absence.

The percentage cumulative frequencies and cumulative risk distributions for the five main categories of injury location are shown in Figures 3.3 and 3.4, respectively.
The five main categories of injury location, as a function of injury severity, are shown in Figure 3.5. The greatest proportion of injuries for slight (19.5%), minor (23.7%), and
moderate injuries (25.2%) was to the thigh. The knee accounted for 34% of all major injuries ($\chi^2_{48} = 79.9, p < 0.01$).

![Graph showing injury severity distribution by location]

Figure 3.5. Injury severity as a function of injury location

### 3.3.4 Injury nature

Sprains (25.7%), strains (36.2%), contusions (10.1%), and fractures / dislocations (9.4%) accounted for the majority of days of absence. The average days of absence from competitive play and training, as a function of injury nature, was 18.3 ± 31.6, 31.2 ± 16.2, and 9.0 ± 3.7 days for sprains, strains and contusions, respectively. Dislocations (72.0 ± 66.7) and fractures (38.6 ± 28.7) accounted for a significantly greater average period of days of absence ($F_{10,584}=7.93, p < 0.001$). The average period of absence for dislocations was significantly greater than all other types of injuries ($p < 0.01$) with the exception of fractures. The average period of absence for fractures significantly differed from lacerations, strains and contusions; sprains also significantly differed from contusions ($p < 0.01$). The cumulative frequency and cumulative risk distributions for days of absence, for the five most common causes of injury nature, are shown in Figures 3.6 and 3.7, respectively.
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Figure 3.6. Percentage cumulative frequency distributions for injuries as a function of injury nature

Figure 3.7. Percentage cumulative risk distributions for injuries as a function of injury nature

The three main categories of injury nature (strains, sprains and contusions) for injuries, as a function of injury severity, are shown in Figure 3.8. Fractures are also included within Figure 3.8 as they represent the third greatest proportion of major injuries. The largest proportion of
injuries in minor (44.7%), moderate (44.9%) and major (32.9%) injury categories was for strains, and contusions for slight (39.8%) injuries ($\chi^2_{33} = 150.8, p < 0.001$).

Figure 3.8. Injury severity as a function of injury nature

3.2.5 Injury mechanism

Player-to-player contact was responsible for 38.9% of the total days of absence, compared to 46.5% for football specific activities. Being tackled (23.7%) accounted for the greatest proportion of days of absence from injury. Furthermore, running (17.4%), tackling (12.7%), and shooting activities (11.9%) accounted for high proportions of days of absence.

There were no significant differences between the average days of absence for any of the injury mechanisms, whether individually assessed or categorised as player-to-player contact ($14.8 \pm 25.8$) (being tackled, tackling, collisions), or football specific activities ($14.4 \pm 19.6$) (running, shooting, jumping, landing, heading, turning). The average days of absence from play were not significantly different for the injury mechanisms of heading ($21.1 \pm 51.3$), landing ($18.7 \pm 28.2$), overuse ($17.4 \pm 28.8$) or tackling ($16.5 \pm 17.4$).

The percentage cumulative frequency and percentage cumulative risk distributions for injury mechanisms are shown in Figure 3.9.
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Figure 3.9. Percentage cumulative frequency and cumulative risk distributions for injuries as a function of injury mechanism

Player-to-player contact mechanisms (41.7%) and football specific activities (42.1%) accounted for similar proportions of all injury mechanisms. The four main mechanisms of injury, as a function of level of injury severity, are shown in Figure 3.10. Contact with another player whilst being tackled accounted for the largest proportion of injuries in the slight (31.7%), minor (23.6%) and major (23.5%) injury categories. However, running was the major mechanism for injury in the moderate injury category (24.2%) ($\chi^2_{30}=47.1$, < 0.05).
Figure 3.10. Injury mechanism as a function of injury severity

The relationship between categories of injury mechanism and the most common injury nature, Figure 3.11, and injury location, Figure 3.12, were also assessed. Player-to-player contact was responsible for 93.8% of contusion injuries and 59.4% of sprains. The major cause of strains was due to football specific activities (72.1%), which also accounted for 35.0% of sprains. Player-to-player contact caused 55% of fractures (all by tackling initiated by the injured party). Player-to-player contact was the major injury mechanism for ankle (61.9%) and knee injuries (56.8%). Football specific activities accounted for the majority of groin (46.8%), thigh (71.3%), and lower leg (43.6%) injuries.
Figure 3.11. Injury nature as a function of injury mechanisms

Figure 3.12. Injury location as a function of injury mechanisms
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3.3.6. Percentage cumulative frequency and cumulative risk

The 50% cumulative frequency and cumulative risk midpoints for injury location, injury nature and injury mechanisms are shown in Table 3.2. These are the levels where 50% of the number of injuries and 50% of the risk from injury are identified as categories by days of absence.

Table 3.2. Injury frequency and injury risk as functions of aetiological factors

<table>
<thead>
<tr>
<th>Aetiological factor</th>
<th>50% cumulative frequency (days)</th>
<th>% risk at 50% cumulative frequency</th>
<th>50% cumulative risk (days)</th>
<th>% frequency at 50% cumulative risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>New injuries</td>
<td>≤ 8</td>
<td>19</td>
<td>≤ 28</td>
<td>86</td>
</tr>
<tr>
<td>Re – injuries</td>
<td>≤ 10</td>
<td>19</td>
<td>≤ 44</td>
<td>91</td>
</tr>
<tr>
<td><strong>INJURY LOCATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Groin</td>
<td>≤ 10</td>
<td>20</td>
<td>≤ 30</td>
<td>85</td>
</tr>
<tr>
<td>ii. Thigh</td>
<td>≤ 8</td>
<td>24</td>
<td>≤ 18</td>
<td>86</td>
</tr>
<tr>
<td>iii. Knee</td>
<td>≤ 12</td>
<td>13</td>
<td>≤ 42</td>
<td>87</td>
</tr>
<tr>
<td>iv. Lower leg</td>
<td>≤ 6</td>
<td>12</td>
<td>≤ 42</td>
<td>92</td>
</tr>
<tr>
<td>v. Ankle</td>
<td>≤ 10</td>
<td>27</td>
<td>≤ 20</td>
<td>81</td>
</tr>
<tr>
<td><strong>INJURY NATURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Strains</td>
<td>≤ 8</td>
<td>21</td>
<td>≤ 20</td>
<td>86</td>
</tr>
<tr>
<td>ii. Sprains</td>
<td>≤ 10</td>
<td>17</td>
<td>≤ 32</td>
<td>86</td>
</tr>
<tr>
<td>iii. Contusions</td>
<td>≤ 6</td>
<td>28</td>
<td>≤ 12</td>
<td>83</td>
</tr>
<tr>
<td>iv. Fractures / Dislocations</td>
<td>≤ 40</td>
<td>20</td>
<td>≤ 90</td>
<td>81</td>
</tr>
<tr>
<td><strong>INJURY MECHANISM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Player contact</td>
<td>≤ 8</td>
<td>17</td>
<td>≤ 28</td>
<td>88</td>
</tr>
<tr>
<td>ii. Football related</td>
<td>≤ 8</td>
<td>18</td>
<td>≤ 22</td>
<td>86</td>
</tr>
</tbody>
</table>
3.3.7. Re-injuries

Re-injuries and severity

Re-injuries accounted for 27% (2382) of the total days of absence (8821), with slight, minor, moderate and major injuries accounting for 1.6%, 9.9%, 35.0% and 53.5% of this proportion, respectively. The average number of days of absence due to re-injury was $2.7 \pm 0.2$, $5.6 \pm 0.5$, $14.2 \pm 1.0$, and $79.8 \pm 17.5$ for slight, minor, moderate and major injuries, respectively (main effect: degree $- F_{6,582} = 7.41, p < 0.001$). The proportion of days absence for re-injuries as a function of injury severity were similar (slight: 17.6%, minor: 20.0%, moderate: 26.0%, major: 25.0%).

Re-injuries and location

The average period of absence for re-injury location was significantly different ($F_{11,568} = 2.04, p < 0.05$) (knee: $41.4 \pm 6.0$, foot: $22.5 \pm 11.2$, lower leg: $18.8 \pm 4.9$, thigh: $17.3 \pm 4.1$, ankle: $13.5 \pm 4.4$). The absence period for the knees was greater than all other locations ($p<0.05$). The knee also accounted for the largest proportion of days of absence due to re-injury (knee: 24.3%, thigh: 21.8%, lower leg: 16.5%, ankle: 14.8%). Figure 3.13 shows the proportion of re-injuries compared to the proportion of days of absence.

![Proportion of re-injuries vs Proportion of days absent](image)

Figure 3.13. Number and risks from re-injury as a function of location
The thigh was the site with the greatest number of re-injuries (23%) closely followed by the ankle (18.6%), lower leg (13.7%), groin (13.0%) and knee (13.0%) ($\chi^2 = 89.6, p < 0.001$). There were no significant differences in the severity of re-injury and injury location, Figure 3.14.

![Graph showing re-injuries as a function of injury location and injury severity](image)

Figure 3.14. Re-injuries as a function of injury location and injury severity

Re-injuries and injury nature

The number of days of absence from re-injury differed significantly for injury nature (fractures / dislocations: $71.5 \pm 89.8$; sprains: $22.4 \pm 53.0$; strains: $13.8 \pm 17.5$; contusions: $7.7 \pm 6.9$) ($F_{10,569} = 5.5, p < 0.001$). Fractures / dislocations significantly differed to all other injury nature ($p < 0.01$); sprains significantly differed from the average period of absence for contusions ($p < 0.01$).

Strains (37.5%) and sprains (32.8%) accounted for the majority of days of absence due to re-injury. Figure 3.15 shows the proportion of re-injuries according to injury nature and the proportion of days absent.
The distribution of re-injuries for the three main categories of injury nature are shown in Figure 3.16. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

The proportion of re-injuries and proportion of days absent for the three main categories of injury nature are shown in Figure 3.16. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

The distribution of re-injuries for the three main categories of injury nature and injury severity are shown in Figure 3.16. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

The diagram shows the distribution of re-injuries for the three main categories of injury nature and injury severity. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

Figure 3.15. Number and risks from re-injury as a function of injury nature

The distribution of re-injuries for the three main categories of injury nature are shown in Figure 3.16. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

The diagram shows the distribution of re-injuries for the three main categories of injury nature and injury severity. Sprains (24.8%) and strains (48.4%) accounted for the majority of re-injuries by injury nature ($\chi^2_{10} = 387.0, p < 0.001$). Fractures / dislocations accounted for 11.5% of re-injuries.

Figure 3.16. Re-injuries as a function of injury nature and injury severity
Re-injuries and mechanism of injury

The number of days of absence due to re-injury was not significantly different for injury mechanism classified broadly (player to player contact: 18.4 ± 23.9, football specific: 19.2 ± 54.5) or individually (running: 13.5 ± 14.3, being tackled: 31.3 ± 80.4, overuse: 22.6 ± 29.6, landing: 47.0 ± 57.2, tackling: 9.7 ± 6.2). Football specific factors (52.5%) accounted for a greater proportion of days of absence compared to player-to-player contact (26.7%) and other sources (20.8%). When the re-injury mechanisms were classified in smaller categories, running (21.5%), being tackled (19.7%), overuse (15.2%) and landing (9.9%) accounted for the largest proportion of days of absence. Figure 3.17 shows the frequency of re-injuries as a function of injury mechanism.

The majority of re-injuries were due to football specific factors (53.1%) compared to player-to-player collision (22.5%) and other causes (24.4%). The major factor responsible for re-injury was running (29.4%), followed by overuse (15.6%), turning (11.3%) and being tackled (10.6%) ($\chi^2_{10} = 119.8, p < 0.001$), Figure 3.17. There were no significant differences between re-injury severity and injury mechanism.

![Figure 3.17. Re-injury mechanisms and injury risk](image-url)
Figure 3.18. Re-injuries as a function of injury mechanism and injury severity
Chapter 3: Risks of injury to professional football clubs

3.4 DISCUSSION

There are a number of UK, European and American studies which have provided detailed information on the epidemiology of injuries in association football (soccer) at youth, amateur, semi-professional and professional standards (Keller et al, 1987; Lewin, 1989; Fried and Lloyd, 1992; Inklaar, 1994a; McGregor and Rae, 1995; Larson et al, 1996). However, there are varied injury definitions used and varied findings, making it important to refer only to data relevant to the country of origin and the level of play. Furthermore, all of these studies describe injury in terms of its probability or incidence. This type of information is insufficient to accurately describe the risks to the clubs and players concerned so that it can be used to evaluate the impact that this risk has on the football industry. Hence, it was the aim of the present study to present epidemiological data from English professional football clubs that could be used to construct a framework for management investment decisions on injury prevention, treatment and rehabilitation.

3.4.1 Injury overview

It has been reported that IFRs for professional footballers are over 1000 times higher than British industry (Hawkins and Fuller, 1999). In addition, the present analysis has shown that such high IFRs also result in players losing 13% of their total training and playing time during the season. This is 50 times greater than the average absence periods for British industry employees in a similar year (Davis and Teasdale, 1994; Health and Safety Commission, 1998).

The periods of absence in the present data have been shown as a frequency distribution, Figure 3.1. In this figure, the sum of the areas under the new injury and the re-injury curves represents the total risk to the football club. However, little information regarding the risk to the club can be obtained directly from this figure. A more detailed analysis of the injury data in Figure 3.2 reveals the difference between the frequency (probability) and risk of injury. Fifty percent of new injuries accounted for periods of absence of eight days or less, whereas, half the risk to the club is accounted for by injuries resulting in periods of absence of 28 days or less. The first fifty percent of risk from injury was caused by 88% (532) of injuries, whilst the remaining fifty percent of risk was caused 12% of the injuries. When injuries are subdivided into categories according to injury location, injury nature and injury mechanism, the differences arising from reporting injuries as an injury risk as opposed to an IFR are highlighted further, Table 3.2. Injury frequency rates can potentially under-represent the risk to the player and club in all instances. A specific location or nature of injury that has the
largest occurrence does not necessarily provide the largest risk to the club, e.g. contusions, whilst an injury with a small occurrence does not necessarily provide a small risk to the club, e.g. dislocations / fractures, Table 3.2.

Each aetiological factor related to injury must also be placed in context of the total risk of player injury to the football club. In general, the present study has shown that the greatest frequencies of injuries were in the minor and moderate categories. However, major injuries accounted for 47% of all days absent, and therefore represented the greatest risk to the football club. Moderate injuries (35%) also accounted for a large proportion of the days of absence, compared to minor (15%) and slight injuries (3%). In other professional football epidemiology, Ekstrand and Gillquist (1983b) reported that slight / minor injuries accounted for 62% of all days of absence, compared to moderate (27%) and major (11%) injury categories. Data from Engstrom et al (1991) were similar to the present study, with moderate (39%) and major (34%) injuries accounting for the majority of days of absence compared to slight / minor injuries (27%).

3.4.2 Injury location

The knee accounted for the largest proportion (34%) of major injuries in the present analysis. Furthermore, the knee accounted for the majority of days absent as a function of all injuries (22.3%) with the thigh providing the second highest risk to the club (18.5%) in terms of days of absence. The knee is a commonly reported location for injury site in football epidemiology (Inklaar, 1994a; Ekstrand and Gillquist, 1983b; Keller et al, 1987; Lewin, 1989; McGregor and Rae, 1996). Furthermore, Engstrom et al (1991) have reported that of thirteen major knee injuries, eleven required surgical intervention and a consequential extended period of rehabilitation. Within the present study, a high number of knee ligament sprains was also reported, which is similar to other UK football injury epidemiology (Lewin, 1989; McGregor and Rae, 1996). A recent report on career ending injury within English professional football has also indicated that the knee was responsible for half of all cases leading to permanent total disability (Windsor, 1997). From a risk management perspective, it is important to address the risk of injury to the knee because it accounts for a large proportion of the total risk to a club. A more detailed analysis of the risks inherent with knee injuries has shown that 50% of knee injuries resulted in periods of absence of twelve days or less, but 50% of the risk equated to those knee injuries resulted in periods of absence of 42 days or less. Therefore, a small proportion of injuries to the knee (13%) led to an absence period of greater than 42 days, which accounts for 50% of the risk to the club in terms of injury consequence and costs. This
pattern, whereby a small proportion of injuries with long periods of absence account for a major part of the risk to the club, is similar for all injury locations analysed.

3.4.3 Injury nature

Strains, sprains and contusions are generally the most common forms of injury nature in the present study and other football epidemiology (Sandelin et al, 1985; Inklaar, 1994; Keller et al, 1987; McGregor and Rae, 1995; Larson et al, 1996). Strains (36%) and sprains (26%) also accounted for the largest proportion of days of absence. Although contusions accounted for a large majority of slight and minor injuries, the overall risk to the club was relatively small (10%) in comparison. Although the levels of injury are different between industry / commerce and professional football, the nature of injuries in these different work environments is very similar (Health and Safety Commission, 1998), i.e. the greatest frequency of injuries is accounted for by sprains and strains, followed by contusions, fractures, lacerations. The major differences between the professional football and industry / commerce is in the location of injury. In industry, where the upper limbs are used for most work activities, it is, not surprisingly, the upper limbs that are the major sites of injuries (Health and Safety Commission, 1998) compared to the lower limbs in professional football.

In contrast to sprains and strains, the frequency of dislocations and fractures in the present study was relatively low but the relative risk to clubs was high. Implementing procedures to reduce the frequency of dislocations / fractures injuries without influencing the nature of the activity would be difficult for a club to achieve. However, analysis in the present study has shown that the majority of fractures / dislocations were sustained by the player tackling. It can be argued based on this finding that injury prevention is in the control of the player and the management playing system. Player and coach education are ways of eliminating such incidents, nature and mechanisms of injury. If the incidents leading to fractures / dislocations were due to a particular form of player behaviour, e.g. aerial contacts, there would be the requirement for rule modifications by F.I.F.A. This is a dearth of research that has addressed this area and could potentially provide some important recommendations for the future of the game.

3.4.4 Injury mechanism

Although there were no differences according to injury mechanism, football specific activities were greater in terms of the proportion of days of absence compared to player-to-player factors (47% vs. 39%). Being tackled (24%), and tackling (12.7%) as part of player-to-player
contact, and running (17%) and shooting (12%) as part of football specific activities, accounted for significant proportions of the number of days of absence due to injury mechanism.

In terms of management and reducing injuries from player-to-player contact, the ruling authority, i.e. FIFA, is the only organisation that can control how much contact there is in competitive football and the resultant risk due to player-to-player contact. Recent changes in the laws have been introduced to help reduce the incidence and risk of injury e.g. tackling from behind, but as of yet there is no current availability of injury epidemiology that can evaluate the changes in injury patterns because of this rule change. The current results indicate that there is still a high proportion of injuries caused by player-to-player contact, primarily resulting in sprains of the knee and ankle. It is unknown if these injuries are caused by rule violation. F.I.F.A and Fuller have just established a collaborative project to address these areas of concern.

As part of player-to-player contact mechanisms, risk taking behaviour and aggressive behaviour have been shown to contribute to 28% – 33% of injuries as ruled by the referee (Ekstrand and Gillquist, 1983c; Engstrom et al, 1990). Within the English professional leagues, out of 998-recorded fouls from 49 Premier League matches, 17 resulted in minor or moderate injuries. In the Football League First division, from the 2048-recorded fouls, 61 incidents resulted in moderate or minor injuries (Hawkins and Fuller, 1998a). As a comparison, at international level, 33 (35%) of the treatments required on the pitch by the physiotherapist were due to rule violation (Hawkins and Fuller, 1996). Furthermore, of the 1272 fouls recorded, three of the incidents led to moderate injuries and 30 were classified as minor injuries. In the European Championships in 1996, of the 1011 fouls recorded, only one moderate injury and 21 minor injuries were recorded (Hawkins and Fuller, 1998a). Further work needs to be done to identify the influence of human behavioural factors of the causes of these injuries, but rule modifications could reduce the risk of an injury associated by contact and player-to-player mechanisms. Improvements in player technique through coaching could also potentially lead to a reduction in player-to-player contact and the risk of injury.

Football specific factors that are responsible for injury are strictly under the control of the player and the club’s health and safety management procedures. The physical, physiological, and psychological aspects of a player’s welfare are ultimately the responsibility of their employer, and as such, clubs are governed by UK Government Regulations on Health and Safety (MHSW, 1992). The Management of Health and Safety at Work Regulations (MHSW) (1992) provide practical guidance on aspects of health and safety management for employers.
By failing to adhere to these Regulations and following good practice, clubs and players are at increasing risk of litigation. The Regulations also cover the responsibilities of the player as an employee. Within the present study this is highlighted by the fact that mechanism of injury attributed to fractures and dislocations was due to the player initiating the tackle. In response to this assessment, player and coach education would be essential to reduce the risk and the incidence associated with fractures and dislocations.

3.4.5. Re-injuries

Within professional football, the likelihood of a more severe injury is increased if it is a re-occurrence of a previous injury. Results from this study support this, as the average period of absence for re-injuries was 33% greater than for new injuries. In a prospective study of Swedish footballers, 20% of minor injuries were followed by a moderate or major injury within two months of the original injury (Ekstrand and Gillquist, 1983b). The present study has shown that at the 50% cumulative frequency level for re-injuries, the period of absence is less than or equal to 10 days. However, the 50% cumulative risk level covers all re-injuries of a period of absence of 44 days or less, which corresponds to 91% (120) of all re-injuries. Therefore, only 9% (12) of re-injuries, which lead to periods of absence greater than 44 days, account for 50% of the risk to the club. Inadequate rehabilitation and incomplete healing have been suggested as key reasons for re-injuries in football (Inklaar, 1994b). It is likely that pressure from club management and the players’ need and desire to return to first team before complete recovery (Lewin, 1989; Hicks, 1998; Waddington et al, 1999) are the prime factors responsible for the incomplete healing. In a study of Belgian players, 30% of the sprains and strains were identified as re-injuries of the same type and location, which also suggests neglect of previous injuries and a premature return to competition (Lysens, 1988). In general, ankle sprains, knee sprains and thigh strains have been identified as the injuries with the greatest risk of re-injury (Inklaar, 1994a).

Football clubs could reduce the risks of re-injury by introducing health surveillance programmes, based on benchmarking a player’s fitness and physical condition through pre-recruitment, pre-season, during the season, post-season and especially post-rehabilitation assessments (Fuller and Hawkins, 1997). Club management should understand that returning players who are still recovering from injury, could lead to additional physical deterioration, and is condoning an unsafe practice; as such there is a breach of health and safety legislation.
Chapter 3: Risks of injury to professional football clubs

3.4.6. Underlying injury causes and risk reduction procedures

The reduction of risk to a professional football club is dependent on addressing the underlying causes of the injuries that are responsible for the risk. The present chapter has shown that these risk factors include major and moderate injuries; strains and sprains; the thigh (posterior), knee and ankle; and player-to-player contact and football specific injury mechanisms. The player-to-player injury mechanisms are essentially the responsibility of FIFA and the current rule structure of the activity. Hence, clubs can allocate greater resources, decision making and emphasis to those injuries caused by football specific factors.

Muscle strain injuries

In the present study, posterior thigh muscle strains were identified as a major risk to the club, Figure 3.4. Strains are a result of excessive stretch during eccentric exercise combined with simultaneous activation of the muscle (KuJala et al, 1997). Within football, this kinesiological movement pattern repeatedly occurs during sprinting, decelerating, turning and cutting movements, and any form of kicking action. The present study has identified that these football specific mechanisms are responsible for the majority of thigh, Figure 3.12, and strain injuries, Figure 3.11.

The risk of the injury at this site is also increased when disturbances occur between the agonist and antagonistic muscle pairing of the anterior and posterior thigh muscles. Any momentary losses in co-ordination can upset eye-foot co-ordination and any proprioceptive impulses from the brain to the muscles. Unexpected actions can disorganise the combination of flexor and extensor contraction failing to protect the surrounding structures (Lennox, 1993). By recognising this as a contributing factor to thigh and knee injuries, an increase in proprioceptive training for the joints and surrounding musculature should reduce the risk of such injuries. Intervention studies have shown a reduction in injury rate with proprioceptive training (Tropp et al, 1985; Caraffia et al, 1996).

A posterior muscle strain is a complex multiple injury factor that represents the relationship between strength imbalances and lack of flexibility, muscle fatigue and insufficient warm up (Inklaar, 1994b; KuJala et al, 1997). All of these muscle strain risk factors have been manipulated through intervention, in an attempt to improve performance and to reduce injury incidence. The use of isokinetic testing to assess and treat muscle imbalances between muscle pairs, and right and left limbs has been used in football players (Poulmedis, 1985; Paton et al, 1989; Orchard et al, 1997) with various degrees of success in injury evaluation and reduction.
_delay of muscle fatigue through nutritional intervention and nutritional strategies has also been recommended for footballers (Clark, 1994; Hargreaves, 1994; Maughan and Leiper, 1994). By addressing and implementing a nutritional strategy there is likely to be a reduction in the probability of a muscle strain by delaying the onset of fatigue.

In addition to addressing muscle imbalances and nutritional guidance, incorrect exercise preparation and conditioning have also been identified as causes of injury. An appropriate warm up with a pre-exercise stretch prior to exercise is critical because the ability of the musculo-tendinous unit to absorb energy is directly proportional to the muscle resting length and muscle temperature (Safran et al, 1988; 1989; Taylor et al, 1990). The warm-up increases the ability of the muscles to absorb forces, decreases muscle viscosity, and increases muscle elasticity allowing a greater force and degree of lengthening during eccentric contractions (Safran et al, 1988). Ekstrand and Gillquist (1982) have also identified poor flexibility as a factor for thigh injury, caused by the training programme or player's previous muscle injuries. Lysens (1988) showed a positive correlation between muscle tightness and strains of the thigh in Belgian football players. Preventive strategies with professional footballers have indicated that by improving flexibility in the lower extremity, muscle strain injuries can be reduced (Amason et al, 1994; Ekstrand and Gillquist, 1982).

The control measures required to address the risk factors associated with muscle imbalance, nutritional interventions, flexibility and warm-ups are available to clubs at relatively minimal costs compared to the potential losses from new and re-injuries. Currently, many clubs are deficient in the application of these strategies (Hawkins and Fuller, 1998b) due to a lack of appropriate support services (Drawer and Fuller, 1999) and are therefore failing to fulfil their health and safety obligations (MHSW, 1992).

Knee injuries

The present study has shown that there is a high risk to a club if a player receives a knee related injury, Figures 3.6 and 3.7. Knee injuries are more likely to be of a serious nature, potentially leading to permanent total disability. Nearly 50% of all career-ending injuries in English professional football are due to knee related injuries (Windsor, 1997). The reduction of knee injuries and improvements in surgical repair techniques and results are required to reduce the risk to the club and the player. After an acute knee injury, many players experience ligament laxity that increases the risk of recurrent injury within the knee joint (Ekstrand and Gillquist, 1983b).
The mechanical and functional instability of the knee naturally predisposes athletes to injury (Inklaar, 1994b) although this instability might not necessarily be the underlying factor responsible for the injury. In a prospective study over two years, it was demonstrated that knee injuries were primarily caused by biomechanical defects of lumbar lordosis and sway back (Watson, 1995). It is important therefore to treat the underlying cause to reduce the incidence of knee injuries and the likelihood of re-injury. A prospective intervention study has also demonstrated that a controlled proprioceptive training programme can reduce the risk of such serious knee ligament injuries in amateur soccer players (Caraffa et al, 1996). Clubs and players are required by UK health and safety legislation to ensure that the risks associated with the impact of such serious knee injuries are reduced through appropriate injury prevention techniques.

**Ankle injuries**

As many of the sprains reported in the present study were located in the ankle complex, further prevention techniques should be considered by clubs in order to reduce the risk of such injuries. The majority of ankle injuries tend to be to the lateral ligamentous complex caused by the forced inversion and plantar flexion in jumping and kicking type activities (Ekstrand and Gillquist, 1983b; Renstrom and Konradsen, 1997). Ankle injuries are also influenced by problems with ankle mechanics and defects (Watson, 1995). An injury to the ankle predisposes the complex to re-injury because of the resulting ligamentous laxity induced through the forced inversion (Ekstrand and Gillquist, 1983c). There is a consensus that those players with previous ankle injury have a decreased risk of re-injury if a semi rigid orthosis is worn (Barker et al, 1997). Taping is no longer recommended, as it tends to loosen with physical activity by as much as 50%, it can become expensive and also requires an experienced physiotherapist or trainer to apply the tape (Rogers, 1998).

In South African footballers, Surve et al (1994) showed a five-fold reduction in recurrent ankle sprains by ensuring players wore a sport stirrup orthosis. By using an ankle disc training programme, the incidence of recurrent ankle sprains can also be reduced (Tropp et al, 1985). By protecting those ankle injury prone players with these simple and cost effective methods of injury reduction, the risk of a recurrent sprain is reduced for a club.

3.4.7 The impact of players' injuries on team-performance and club-turnover

The identification of injury risk in terms of frequency and severity has highlighted the severity, nature, location and mechanism of injury that are likely to have greatest impact on
the risks for a football club. With the majority of professional football clubs failing to achieve a pre-tax profit (Boon et al., 1999), the available resources for players' health and safety are restricted by budget constraints. Consequently, a risk manager must allocate the resources to those control measures that will provide the best return in terms of injury impact reduction. To assess the most effective return from injury reduction, the risk framework model, Chapter 2, can be used to assess the impact of the levels of risk presented in the present chapter from a financial and playing performance perspective.

The impact, on professional football clubs, of players' injuries manifests itself in several ways, which include losses in both team-performance and financial performance. Any reduction in the available team-quality would lead to a reduction in team-performance, Figure 2.2, which would be reflected in a consequential reduction in club-turnover, Figure 2.3. These losses could result from the elimination from cup competitions, poorer final league placing, reduced television coverage and loss of advertising and merchandising revenue. To define the financial consequences associated with performance, Figure 2.18 shows the club-turnover required to maintain a given league position within the four English professional leagues.

The empirical relationship between relative team-quality and relative team-performance, which is defined in Figure 2.2 and Table 2.2, is represented by equation (1):

\[ \log \left( \frac{Q_i}{Q_A} \right) = -m \log \left( \frac{P_i}{(93 - P_i)} \right) - c \]  

If the availability \( L \) (\( 1 \geq L \geq 0 \)) of players within a team \( i \) was reduced through injury the relative team-performance would be reduced to a level described by equation (2):

\[ \log \left( \frac{LQ_i}{Q_A} \right) = -m \log \left( \frac{P_i^L}{(93 - P_i^L)} \right) - c \]

Where \( P_i^L \) represents the new league position based on the level of player availability equal to \( L \). The empirical relationship presented in Figure 2.2 was obtained with the prevailing player absence level of 13%, which is equivalent to a player availability of \( L = 0.87 \). If equations (1) and (2) are combined, a relationship can be obtained that defines a club's current relative league position \( P_i \) and the relative league position \( P_i^L \) if the availability of players was equal to \( L \); viz.:

\[ m \log \left( \frac{P_i^L}{(93 - P_i^L)} \right) = m \log \left( \frac{P_i}{(93 - P_i)} \right) - \log L \]

Equation (3), therefore, enables the loss of league position \( (P_i^L - P_i) \) for any individual team.
to be derived at various levels of player availability, assuming full availability for players in all other teams, Figure 3.19.

![Figure 3.19. The impact of player availability (L) on team-performance](image)

This demonstrates that the impact of injuries is dependent on both the club's current league position and the level of injury. The position of any club can only deteriorate to league position 92, at which point the club would be eliminated from the league. A club in the top half of the Premier League, which would have a large squad of quality players in order to occupy this position, would not be seriously affected by injury until the injury level became very high. It is the clubs situated in the First and Second Divisions of the league structure whose team-performances would be most seriously affected by players' injuries. Here, for example, teams within the First Division that might otherwise finish first (overall league position 21) could, with a 40% injury rate (L = 0.6), be struggling against relegation to the Second Division (overall league positions 42 – 44). This analysis supports the premise that rich clubs with a large pool of quality players effectively buy themselves away from the relegation zone, whilst the smaller clubs with restricted financial resources are more susceptible to problems associated with injuries to a few key players.

Whilst the above analysis demonstrated that the larger, more successful, clubs in the top ten of the Premier League are reasonably well protected against relegation by the quality of their playing squads, they are not immune to significant financial losses. The dependence of
league position on player availability, derived above from equation (3), can be extended in order to define the consequential impact on club-turnover, Figure 2.3 and Table 2.2. Figure 3.20 shows the derived loss in club-turnover, at each league position, brought about by the reduced team-performance caused by injuries to players. This also illustrates that the top ten clubs in the Premier League are exposed to the greatest potential financial losses. This confirms that, in the Premier League, the loss of only a few league places has significant financial implications, which are caused mainly by failure to qualify for European competitions and reductions in merchandise sales and sponsorship arrangements. Hart et al (1975) have also shown that a change in league position at the top of the playing division, e.g. from 2nd to 3rd, has five times greater effect on attendance levels than further down the league, e.g. 12th to 13th position. These potential losses have most recently been witnessed in the playing and financial performance of Liverpool F.C. A decade (1990 – 2000) of underachievement on the playing field has led to them being an example of a Premier League club incapable of generating an operating profit (Harverson and Garrahan, 1999).

Figure 3.20. The impact of player availability (L) on club-turnover (1997/98 values)

The aim of the work reported here was to describe the risks of injury to professional football clubs and to establish the risk factors that contribute to the greatest proportion of this risk. Only by identifying these risk factors can management implement the relevant risk control strategies that can reduce the risk and consequent impact on each football club. The second part of the present chapter applied the levels of injury risk to the management framework model developed in Chapter 2. This has illustrated how the total injury risk can have a
Chapter 3: Risks of injury to professional football clubs

substantial impact on the playing and financial performance of a professional football club. Individual risk factors and their consequences can also be tested within the model.

The description of injury risk on both playing and financial performance provides the impetus that would enable economic assessments of potential risk-control strategies to be completed. The model presented in Chapter 2 and its consequent application in the present chapter incorporates the key cost factors of team-quality and club-salary and the benefit factors of team-performance and club-turnover, which are required for effective cost-benefit analyses. As the precursor to cost-benefit analysis of a range of control strategies, the application of the model in Chapter 2 has been shown to describe the impact of player availability on both team-performance and club-turnover. Before a cost benefit analysis on a range of control strategies can be evaluated for implementation, additional details are required on the current levels of injury support provision within the clubs. Furthermore, although the model developed in Chapter 2 can provide an indication of the indirect costs to the club, the direct costs of injury must also be described in relation to the indirect costs. The following chapter will provide the details on current injury support to enable a cost benefit analysis of a range of control strategies for injury prevention to be developed for professional football clubs.
3.5 STRENGTHS AND WEAKNESSES

Until recently, the injury database collected by Hawkins and Fuller (1999) has proved to be the most extensive of its kind in English professional football. However, the P.F.A sponsored injury audit, managed by the F.A. Medical Centre and based on the work of Hawkins and Fuller (1999) should eventually provide a much larger database. Despite this, the current information has provided a number of opportunities to investigate the influence that many independent factors, e.g. training conditions and shoe type, have on injury rates and injury types (Smith, 1999). This database has been used to a similar effect in the present study, by investigating the influence that injury has on the risks to the club, measured as the product of the probability of the injury occurring and the severity of the injury concerned. The vast majority of injury epidemiology within professional football has presented injury data in terms of its probability of occurrence and this study is the first known to the author, to present injury data in terms of risk to football clubs. By presenting the data in this manner, management can decide on the appropriate investment and allocation of resources that can reduce the risk of injury. These decisions can now be based on the impact that injury risk has on playing and financial performance.

One of the concerns of the study is that the database has generalised all injuries together by summarising data for all divisions and different clubs. Hawkins (1997) identified through his work that differences in injury patterns were present between countries and clubs. By taking this approach therefore, some of the conclusions regarding management decisions may not be appropriate for different clubs and different countries. Therefore, whilst the database used in this study provides a benchmark, each club must assess their own injury data and assess the major areas of concern that will influence their investment decisions in injury prevention.
CHAPTER FOUR

BENCHMARKING INJURY SUPPORT SERVICES AVAILABLE AT ENGLISH PROFESSIONAL FOOTBALL CLUBS

4.1 INTRODUCTION

The previous chapter provided an assessment of the factors that would provide the major risk to a professional football club. The next logical step within the risk evaluation process is to assess how clubs manage these risk factors. The level of medical and sports science provision used to manage the risk factors, identified in Chapter 3 determines the overall injury risk. By benchmarking current standards and support levels within English football, appropriate judgements can be made on the most suitable investments or changes in procedure required to control the risk. An example is provided by Hawkins and Fuller (1998) in a preliminary assessment of professional footballers’ awareness of injury prevention strategies. The assessment indicated a need for wider education of players in current injury prevention strategies because players failed to wear shin pads during training, did not participate in cool downs after training and competitive matches, or in flexibility development. A poor knowledge of nutritional intake before and after training, and after matches, was also prevalent in their current habits. These preliminary results indicated that football clubs were not meeting the legal requirements under Regulations 8 and 11 of the MHSW Regulations (1992). In response to the findings, the most appropriate strategy would be for clubs to train existing staff on injury prevention strategies to translate the strategies to the players. External specialist staff could also be used to reinforce the strategies required to educate the players and staff.

In addition to the potential legal consequences of failing to control injury risk, Chapters 2 and 3 have demonstrated the playing and financial performance risks associated with injury to players. Professional football clubs now have an obligation to their stakeholders to make the necessary resources available to reduce the risk of injury to their players and themselves and reduce the potential legal, playing and financial consequences. These resources may cover aspects such as providing adequate pitch conditions, implementing correct training procedures, providing adequate rehabilitation and health surveillance, equipment and training protocols, and also providing the education and training for players and support staff in the use of the equipment and procedures.
Whilst in many countries and sports, the physician provides the focal point for a team’s injury and medical management structure (Lynch and Carcasona, 1994; Orchard et al, 1995; Bergfield, 1999; Bolzonello, 1999), in English professional football the physiotherapist traditionally fulfils this role (Crane, 1990). In addition, with the continued growth in medical and sports science knowledge, professional football clubs now increasingly employ a range of additional specialist advisors, e.g. nutritionists, podiatrists, biomechanists, osteopaths and psychologists. Therefore, it may no longer be appropriate or possible for the team physiotherapist to provide or manage the level of support required in the highly competitive and high-risk environment of English professional football. Furthermore, there is a trend by European players in English clubs, when they are seriously injured, to consult and be treated in Europe by specialists, whom, they perceive, have greater experience and expertise. Comments (Ley, 1998; Winter, 1998a) by these players have focused attention on current standards of injury prevention, treatment and rehabilitation and this has therefore drawn into question whether the medical and sports science services available within English football are adequate. Curry (1997), in an assessment of methods used at three Italian Serie A clubs, stated: “There is no question that we (the English Leagues) are light years behind the Italians when it comes to the overall medical care of players both in respect of diagnosis and of treatment”. Furthermore, a recent report highlighted the current poor practice in the management, treatment and attitudes to player injury within professional football (Waddington et al, 1999). By failing to show a duty of care towards the players and their injuries, coaches (Farr, 1996; National Coaching Foundation, 1997) and physiotherapists (Dimond, 1982; Macauley, 1998) are at increased risk of litigation against themselves and their respective employers.

The aim of the study therefore, was to assess and benchmark the injury prevention, treatment and rehabilitation support services within professional football clubs. This would complement the information available on the deficiencies in players' injury prevention awareness and enable an appropriate health and safety strategy to be developed for the players based on current standards. This strategy could then be assessed as part of the risk evaluation process. The secondary aim of the study was to assess the capability, in terms of time and qualifications, for physiotherapists to manage the support services available.
4.2 METHOD

The audit was designed with physiotherapists as the focal source of information as they traditionally provide injury prevention, treatment and rehabilitation services at English professional football clubs.

4.2.1 Implementation of the audit programme

A questionnaire / audit based survey was planned and piloted with three current and three ex-professional football club physiotherapists, all with differing levels of experience and qualifications. The document was distributed with a pre-paid envelope and letter of explanation to the senior physiotherapist at each of the 92 English professional football clubs during the 1997/98 season. A second mail distribution was used after eight weeks to remind those who had not responded. Follow up telephone calls were carried out when necessary to clarify the information provided.

4.2.2 Selection and categorisation of the audit programme

The audit consisted of questions divided into six main categories with each category divided into a number of sub-categories. The six main categories provided information on: demographics; facilities; specialist advisors; techniques; use of specialist advisors and staff during training and match preparation; and time spent by the senior physiotherapist in other tasks (appendix 1).

The questions within the six categories addressed the areas of injury prevention, injury treatment and rehabilitation. The audit programme provided information, which followed the management structure shown in Figure 4.1. In each case, the physiotherapists were asked to select those items that were directly within the club or for which arrangements were already in place for their use elsewhere.
Figure 4.1. Framework used to assess the provision of support services.
Chapter 4: Benchmarking injury support services

The audited facilities, specialist advisors and techniques which fall into the structure depicted in Figure 4.1 are shown in Tables 4.1, 4.2 and 4.3. Table 4.1 lists twenty-two of the essential and more common facilities used by club physiotherapists, covering aspects of assessment, treatment and active / passive rehabilitation that were audited. The treatment / rehabilitation aids were categorised as assessment tools and modalities. The injury prevention aids were categorised as cardiovascular and resistance equipment (Martin and Curl, 1993; Norris, 1993; Williams and Whitehouse, 1993; Young and Dyson, 1993; DePalma, 1994; Prentice, 1994a).

Table 4.1. Facilities included in the audit programme.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub Category</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury treatment / rehabilitation</td>
<td>Assessment tools</td>
<td>X rays; CT scans; MRI scans</td>
</tr>
<tr>
<td></td>
<td>Modalities</td>
<td>Ultrasound; interventional waveform currents; constant shortwave diathermy; laser; T.E.N.S.; pulsed shortwave diathermy (megapulse); oxygen tank</td>
</tr>
<tr>
<td>Injury prevention</td>
<td>Cardiovascular equipment</td>
<td>Treadmill; cycle; stepper; rower; skipping ropes; swimming pool</td>
</tr>
<tr>
<td></td>
<td>Resistance equipment</td>
<td>Free weights; fixed weights; isokinetic machine; trampet; wobble boards; spring / pulleys.</td>
</tr>
</tbody>
</table>

Table 4.2 lists twelve of the more common sports science specialists and medical specialists that were identified and audited. The role of development officer was also audited for comparison with Italian Serie A clubs. There are other specialists that would be required by the players on ad hoc occasions to cater for other requirements e.g. dentist, optician. The use of such specialists is limited because of the low frequency of oral and visual injuries in professional football (Ekstrand and Gillquist, 1983; Lewin, 1989; McGregor and Rae, 1996; Hawkins and Fuller, 1999).
Table 4.2. Categorisation of audited sports science and medical specialists

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub category</th>
<th>Audited specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury treatment / rehabilitation</td>
<td>Medical science</td>
<td>Podiatrist / chiropodist; osteopath / chiropractor; masseur; radiologist; doctor; orthopaedic surgeon; physiotherapist; neurologist</td>
</tr>
<tr>
<td></td>
<td>Sports science</td>
<td>Sports psychologist</td>
</tr>
<tr>
<td>Injury prevention</td>
<td>Medical science</td>
<td>Physiotherapist</td>
</tr>
<tr>
<td></td>
<td>Sports science</td>
<td>Nutritionist; fitness advisor; biomechanist and masseur</td>
</tr>
</tbody>
</table>

Twenty-two different injury prevention and treatment / rehabilitation techniques that are commonly used were identified (Chan and Hsu, 1993; Norris, 1993; Hubbell and Buschbacher, 1994; Prentice, 1994a; Paulos et al, 1991). These techniques were allocated to two injury prevention categories, cardiovascular and muscular, and three stages of physiological injury repair, acute / inflammation care, fibroblastic repair, maturation / remodelling (Grana, 1993; Jarvinen, 1993; Norris, 1993; Young and Dyson, 1993; DePalma, 1994; Hubbell and Buschbacher, 1994; Hunter, 1994; Prentice, 1994b; Almekinders, 1995; Shelbourne and Trumper, 1995; Paulos et al, 1991). However, each stage of injury rehabilitation is not exclusive and some of the techniques are suitable and used for more than one stage of injury repair (Prentice, 1994b).

The selection and assignment of specific techniques to each physiological stage of treatment / rehabilitation is summarised in Table 4.3.
Table 4.3. Categorisation of injury treatment / rehabilitation and prevention techniques used at professional football clubs

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub category</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury treatment / rehabilitation</td>
<td>Acute care / inflammation (Stage 1)</td>
<td>Cryotherapy; electrotherapy; medication and strapping / taping / supports</td>
</tr>
<tr>
<td>Fibroblastic repair (Stage 2)</td>
<td>Vertebral mobilisations and manipulations; peripheral mobilisations / manipulations; McKenzie exercises; A.N.T. techniques; massage; friction massage; supports / strapping / taping and electrotherapy</td>
<td></td>
</tr>
<tr>
<td>Maturation / Remodelling (stage 3)</td>
<td>Functional assessment; cardiovascular conditioning / testing; flexibility conditioning / testing; PNF conditioning; strength conditioning / testing; isokinetic testing; proprioceptive conditioning / testing; biomechanical assessment; orthotic development; and muscle imbalance</td>
<td></td>
</tr>
<tr>
<td>Injury prevention</td>
<td>Cardiovascular</td>
<td>Cardiovascular conditioning / testing; functional assessment.</td>
</tr>
<tr>
<td>Muscular</td>
<td>Functional assessment; flexibility conditioning / testing; PNF conditioning; strength conditioning / testing; isokinetic testing; proprioceptive conditioning / testing; biomechanical assessment; orthotic development and muscle imbalance</td>
<td></td>
</tr>
</tbody>
</table>

Details were obtained on the level of medical and scientific support provided for first team, reserve and youth team training sessions and matches, in order to assess how clubs allocate medical and sports science resources. Seven of the most common medical and sports science support services listed in Table 4.2 were used in this assessment, viz. physiotherapists, podiatrist / chiropodist, osteopath / chiropractor, doctor, orthopaedic surgeon, radiologist, masseur. A neurologist was not listed during this process because the specialist equipment required is unlikely to be available at the training ground or stadium. Sports science support covered the use of a nutritionist, psychologist, masseur and fitness advisor. A biomechanist
specialist was not included within this section because of the rather specific and specialist photographic, filming, digitising and computer equipment required for accurate analysis. Personal communications suggest this is unlikely to be readily available at football clubs.

Although the primary role of a professional football club's physiotherapist is to treat sports injury and return the injured player to full competitive match fitness, the modern demands and requirements of the players and club management place many extra demands on the physiotherapist. Based on the diaries of James Joyce (1994) (Port Vale FC and Southampton FC) and Mark Leather (1995) (Liverpool FC) (Joyce, 1994; Leather, 1995) and personal communications with other physiotherapists, various job tasks were identified as significant components of their working day. These included administration, staff development and training, fitness training / assessment, travel, match attendance and consultations as well as their injury treatment and rehabilitation activities.

The length of time spent on each of these tasks was identified over different stages of the season; pre / early season (June to September), mid season (October to January) and end of season (February to May). Previous work by Hawkins and Fuller (1999) has illustrated that the quantity of injuries across a season tends varies, with peaks occurring during the early months of the season and towards the final few months of the season.

4.2.3 Statistical analysis

All statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS v.9.0.) for Windows computer package. Statistical significance was accepted at the p<0.05 level, unless stated otherwise. Each value is reported as a mean (S.D). Varied statistical techniques were used to assess the results from each section of the audit programme because of the different types of data obtained.

In the assessment of physiotherapy details, ANOVA for independent samples was used when the Levene test for homogeneity of variance was not significant. This statistical procedure was used to assess the influence of the independent factor of Division. If the test for homogeneity of variance was significant, and the largest variance in each group did not correspond with the largest number of variables per group, the Kruskal Wallis $H$ test for three or more unrelated groups was used.

A factorial ANOVA design was used to assess differences in hours (dependent measure) typically spent in physiotherapist job tasks as a function of Division, stage of season and job
task (independent measures). Where the homogeneity of variance tests was significant, the log or square root, depending on which transformation was significant of the dependent variable, was taken to determine significant differences (Bryman and Cramer, 1999). The log-normal transformation of the data is much stronger than a square root transformation. Factorial designs generally provide a more sensitive and powerful statistics test than investigating one factor at any one time (Bryman and Cramer, 1999). Where significant interactions were obtained these superseded the reporting of the main effects of the independent factors.

To assess the differences in medical and sports science cover (dependent factors) within the main factors of league (4 levels: Premier, Divisions 1,2 and 3), players (3 levels: First team, Reserves, Youth), and provision of cover (2 levels: training and competition), a MANOVA statistical model was used. Analysing the two dependent measures together has the advantages of reducing the probability of making a type one error (i.e. rejecting the null hypothesis when it should be accepted) and provides a more sensitive measure of the effects of the independent variables (Bryman and Cramer, 1999). The SPSS allows Box’s M test, which determines whether the variances of the two dependent variables are similar and Bartlett’s test of sphericity, which assesses whether the two dependent measures are correlated. If the result is significant in this latter test, the two dependent measures are related. In this instance, Bryman and Cramer (1999) recommend use of the multivariate test to determine if significant differences are present between the variables.

Exact Chi square tests in contingency tables were used to assess specific differences in the proportion of clubs for facilities, specialists, and rehabilitation techniques. Cohen and Holliday (1998) refer to the problems with the stability of the Chi-square test when there are less than five expected frequencies in any one category or cell. In order to overcome this problem, it is recommended that the number of cells is reduced and the frequencies increased by collapsing tables in a contingency analysis (Cohen and Holliday, 1998). However, it was felt that this process should not be adopted because of the difficulties in collapsing non-related categories. In addition, although Chi-square analysis is traditionally based on asymptotic assumptions, making the results only valid for large samples, SPSS v. 9.0 can test for association and independence exactly. This method extends Fisher’s exact test for a 2 * 2 contingency table and eliminates previous problems with small samples.
4.3 RESULTS

4.3.1 Questionnaire response

The audit questionnaire was distributed to all 92 English professional football clubs. Thirty-seven clubs (40%) returned the audit, eight (21.6%) clubs from the Premier League, ten (27.0%) clubs from the Football League Division 1, twelve (32.4%) clubs from the Football League Division 2 and seven (18.9%) clubs from the Football League Division 3. There were no statistical differences between the numbers of replies from each Division. A graph showing the cumulative responses over the data collection period is shown in Figure 4.2. At week eight a second mail-out was distributed.

![Graph showing cumulative survey response by senior football club physiotherapists](image)

Figure 4.2. Cumulative survey response by senior football club physiotherapists

4.3.2 Physiotherapists demographic information

The average numbers of physiotherapists at each club as a function of Division, qualifications and work status are shown in Figure 4.3. Premier league football clubs have a significantly greater number of physiotherapists than Divisions 1, 2 and 3 \( (F_{3, 36} = 6.8, p < 0.01) \) (Premier: 3.1 ± 1.6; Division 1: 1.8 ± 0.8; Division 2: 1.4 ± 0.8; Division 3: 1.1 ± 0.4). There are also significantly more chartered physiotherapists within the Premier League than Division 1, 2 and 3 clubs \( (F_{3, 34} = 7.6, p < 0.01) \) (Premier: 2.5 ± 1.4; Division 1: 0.9 ± 0.6; Division 2: 1.0
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- 0.5; Division 3: 0.3 ± 0.5, post hoc: $p < 0.01$). The average numbers of physiotherapists holding the diploma qualification did not differ significantly between Divisions (Premier: 0.6 ± 0.9; Division 1: 0.9 ± 0.8; Division 2: 0.4 ± 0.5; Division 3: 0.8 ± 0.6).

When work status (i.e. part-time / full-time) was considered, the Premier League had more full-time physiotherapists than Division 1, 2 and 3 clubs ($F_{3,34} = 6.9, p < 0.01$) (Premier: 2.5 ± 1.0; Division 1: 1.4 ± 0.5; Division 2: 1.0 ± 0.5; Division 3: 1.1 ± 0.5, post hoc: $p < 0.01$). There were no significant differences between Premier, Division 1 and 2 clubs and the number of part-time physiotherapists (Premier: 0.6 ± 0.8; Division 1: 0.4 ± 0.7; Division 2: 0.4 ± 0.4; Division 3: 0.0 ± 0.0).

Figure 4.3. Average number of physiotherapists within professional football clubs according to qualifications and work status (Dip: diploma, Ch: chartered, f: full-time, p: part-time)

There were no significant differences in length of time the qualification was held for either the diploma or chartered status across Division. There were no differences in length of experience at professional football clubs across Division, which was measured by both the time at their present place of employment, and their total experience with professional footballers, Table 4.4.
Table 4.4. Summary of physiotherapists experience by qualification and Division [mean and (S.D.)]

<table>
<thead>
<tr>
<th></th>
<th>Premier</th>
<th>Division 1</th>
<th>Division 2</th>
<th>Division 3</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years chartered</td>
<td>9.3</td>
<td>12.4</td>
<td>5.0</td>
<td>3.0</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>(7.2)</td>
<td>(7.2)</td>
<td>(3.0)</td>
<td>(-)</td>
<td>(6.7)</td>
</tr>
<tr>
<td>Years diploma held</td>
<td>10.7</td>
<td>8.4</td>
<td>14.0</td>
<td>12.1</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>(5.7)</td>
<td>(8.2)</td>
<td>(12.9)</td>
<td>(10.1)</td>
<td>(9.3)</td>
</tr>
<tr>
<td>Years at present club</td>
<td>5.9</td>
<td>3.8</td>
<td>5.1</td>
<td>4.3</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>(4.2)</td>
<td>(3.9)</td>
<td>(4.3)</td>
<td>(4.4)</td>
<td>(4.2)</td>
</tr>
<tr>
<td>Years working with professional footballers</td>
<td>8.7</td>
<td>7.0</td>
<td>9.7</td>
<td>14.4</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>(7.1)</td>
<td>(5.7)</td>
<td>(9.7)</td>
<td>(10.8)</td>
<td>(8.1)</td>
</tr>
</tbody>
</table>

4.3.3 Facility provision

The availability of the injury treatment / rehabilitation assessment tools, Table 4.1, across Divisions is shown in Figure 4.4. There is a non-significant trend for Premier and Division 1 clubs to have arrangements in place for the use of all three of the assessment tools compared to Division 2 and 3 clubs.

Figure 4.4. Availability of assessment tools to club physiotherapists across Division
The availability of injury treatment/rehabilitation modalities, Table 4.1, is shown in Figure 4.5. Premier clubs tended to have a non-significantly greater number of modalities than Division 1, 2, and 3 clubs. Exact Chi-square analysis indicated that significant differences were found for the availability of pulsed short-wave diathermy (megapulse) [Premier: 8 (100%), Division 1: 6 (50%), Division 2: 7 (58%), Division 3: 1 (14%)] ($\chi^2 = 11.4, p < 0.01$) and isokinetic equipment [Premier: 8 (100%), Division 1: 9 (90%), Division 2: 8 (67%), Division 3: 3 (43%)] ($\chi^2 = 8.3, p < 0.05$) for all clubs by division. There were also differences in the availability of a swimming pool [Premier: 8 (100%), Division 1: 10 (100%), Division 2: 10 (83%), Division 3: 4 (57%)] ($\chi^2 = 8.1, p < 0.05$) and x-ray facilities [Premier: 8 (100%), Division 1: 10 (100%), Division 2: 12 (100%), Division 3: 5 (71%)] ($\chi^2 = 9.1, p < 0.05$) for all clubs by Division.

![Figure 4.5. Availability of modalities by Division](image)

Figures 4.6 and 4.7 illustrate the availability of injury prevention facilities, Table 4.1, across Division. Figure 4.6 shows there were no significant differences between Divisions for the availability of cardiovascular equipment. Figure 4.7 tends to indicate that a larger number of Premier league and Division 1 clubs have a greater range of resistance equipment than clubs in other Divisions, with Division 3 clubs having the least selection of equipment.
4.3.4 Technique provision

All clubs across Divisions had full availability of stage one treatment / rehabilitation techniques, Table 4.3. For stage two, all Premier and Division 1 clubs had between six and
nine of the techniques available and eleven (92%) Division 2 and six (86%) Division 3 clubs had between six and nine of the techniques. Only two (5%) clubs had five or fewer techniques available for use for stage two of injury rehabilitation; these clubs were in Divisions 2 and 3.

In stage three of treatment/rehabilitation, all Premier, 1st and 2nd Division clubs had access to between six and ten of the techniques compared to six (86%) 3rd Division clubs. One club had less than half of the techniques available for use. The breakdown of rehabilitation technique availability for each stage of repair is summarised by Division in Table 4.5.

Table 4.5. Availability of rehabilitation techniques during the three phases of physiological injury repair by Division.

<table>
<thead>
<tr>
<th></th>
<th>Stage 1</th>
<th></th>
<th>Stage 2</th>
<th></th>
<th>Stage 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. available techniques</td>
<td>No. available techniques</td>
<td>No. available techniques</td>
<td>No. available techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-2</td>
<td>3-4</td>
<td>0-3</td>
<td>4-6</td>
<td>7-9</td>
<td>0-3</td>
</tr>
<tr>
<td>All</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>5%</td>
<td>95%</td>
<td>0%</td>
</tr>
<tr>
<td>Premier</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Division 1</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Division 2</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>8%</td>
<td>92%</td>
<td>0%</td>
</tr>
<tr>
<td>Division 3</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>14%</td>
<td>86%</td>
<td>0%</td>
</tr>
</tbody>
</table>

There were no differences across Divisions for availability of injury prevention techniques categorised as muscular or cardiovascular, Table 2.3, Figures 4.8 and 4.9. Premier clubs tended to have a non-significantly greater availability of both muscular (7 - 9) [Premier: 8 (100%), Division 1: 9 (90%), Division 2: 8 (67%), Division 3: 5 (72%)] and cardiovascular techniques (2) [Premier: 7 (88%), Division 1: 8 (80%), Division 2: 9 (75%), Division 3: 5 (72%)].
Figure 4.8. Availability of muscular injury prevention techniques by Division

Figure 4.9. Availability of cardiovascular injury prevention techniques by Division

Exact Chi-square analysis of individual techniques showed that the use of flexibility [Premier: 8 (100%), Division 1: 8 (80%), Division 2: 92%, Division 3: 43%] ($\chi^2 = 9.4, p < 0.05$) and strength techniques [Premier: 8 (100%), Division 1: 10 (100%), Division 2: 11 (92%), Division 3: 4 (57%)] ($\chi^2 = 9.7, p < 0.05$) were significantly different. The use of muscle
imbalance techniques was significantly greater for Division 1 clubs, followed by Division 2, Premier and Division 3 clubs [Premier: 5 (63%), Division 1: 9 (90%), Division 2: 9 (75%), Division 3: 4 (43%)] ($\chi^2 = 8.5, p < 0.05$).

4.3.5 Medical and sports science provision

The availability of sports science specialists for injury prevention, Table 4.2, is shown in Figure 4.10. There were no significant differences across Division for the number of sports science specialists, Figure 4.10. However, there were some clubs across Division 1, 2 and 3 clubs with no injury prevention specialists. Figure 4.11 illustrates the availability of the medical specialists, Table 4.2, for injury treatment and rehabilitation excluding the physiotherapist who is analysed separately. Figure 4.11 shows there was a trend for Premier and Division 1 clubs to have a greater variety of injury treatment specialists than clubs in Divisions 2 and 3.

Exact Chi-square analysis showed that significant differences only existed between Divisions for the availability of a nutritionist and osteopath / chiropractor. The employment of a nutritionist was greater for Premier (4) (50%) and 1st Division clubs (6) (60%) when compared to Division 2 (1) (8%) and Division 3 clubs (1) (14%) ($\chi^2 = 8.8, p < 0.05$). The availability and use of an osteopath / chiropractor was significantly higher for Division 1 clubs (8) (80 %), compared to Premier (2) (25%), 2nd (3) (25%) and Division 3 clubs (3) (43%) ($\chi^2 = 8.2, p < 0.05$). The use of sports psychologists within professional football clubs was analysed separately from other specialists, Table 4.2. There were no differences in availability between Divisions [Premier: (2) 25%, Division 1: (2) 20%, Division 2: (2) 17%, Division 3: (1) 14%]. Only 24% of clubs across all Divisions [Premier, 1 (12.5%); First Division, 4 (40%); Second Division, 2 (17%); Third Division, 2 (28%)] employed a development officer part or full-time.
Figure 4.10. Availability of injury prevention specialists by Division

Figure 4.11. Availability of injury treatment / rehabilitation specialists by Division
4.3.6 *Training and competitive match specialist support*

There was a significant difference between Divisions for the total level of medical and sports science support available at clubs (*main effect - Division: $F_{3,396} = 13.7, p < 0.001$). Premier League clubs had much greater support than Division 1, 2 and 3 clubs (Premier: $2.1 \pm 2.0$, Division 1: $1.0 \pm 1.1$, Division 2: $1.3 \pm 1.7$, Division 3: $1.5 \pm 1.7$ - post-hoc: $p < 0.01$). There was also a significant difference between standard of play for the total level of medical and sports science support available at clubs (*main effect – Standard of play: $F_{2,396}=13.1$, $p<0.001$). The first team had much greater support than the reserve and youth teams (first team: $1.8 \pm 1.8$, reserves: $1.3 \pm 1.6$, youth: $1.1 \pm 1.5$ – post-hoc: $p < 0.01$). There was no significant difference in the level of provision in training or competition. There were no significant interactions due to independent factors.

Figures 4.12 to 4.15 illustrate the level of medical and sports science support available for the first, reserve and youth teams by Division as a function of training and competitive matches. For youth players, there were four clubs in competition and two clubs in training, across all leagues, which did not provide any medical specialists (including a physiotherapist). All reserve and first teams had at least one medical specialist present during competition and training. There were many more clubs, which did not provide any sports science cover during competition for the first team (20), reserves (30) or youth teams (33). The provision of sports science support was replicated in the training environment for the first team (20), reserves (24) or youth teams (27).
Figure 4.12. Medical cover provided during training by Division

Figure 4.13. Sports science cover provided during training by Division
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Figure 4.14. Medical cover during competitive matches by Division

Figure 4.15. Sports science cover provided during competitive matches by Division
4.3.7 The physiotherapists’ job role

Table 4.6 shows the average number of hours per week spent by the senior club physiotherapist in each task over the whole of the season. There was a significant difference in total hours worked by physiotherapists across Division ($\chi^2 = 8.0, p < 0.05$). Division 2 physiotherapists tended to work more hours than Premier League, Division 1 and 3 clubs, Table 4.6. There was a significant difference in the hours worked in rehabilitation across Division ($F_{3, 74} = 4.2, p < 0.01$). The time spent in rehabilitation by Premier League and Division 2 physiotherapists was greater than Division 3 physiotherapists ($p < 0.05$). There were no differences, across Division, in the number of hours spent in injury prevention strategies by physiotherapists. Figure 4.16 summarises the relationship in the time spent for injury prevention and injury treatment / rehabilitation tasks across Division compared with other tasks.

Table 4.6. Average number of hours spent per week in various job roles by physiotherapists in professional football clubs by Division.

<table>
<thead>
<tr>
<th>JOB ROLE</th>
<th>Premier</th>
<th>Division 1</th>
<th>Division 2</th>
<th>Division 3</th>
<th>Mean (S.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>6.7</td>
<td>6.6</td>
<td>6.7</td>
<td>6.7</td>
<td>6.7 (4.0)</td>
</tr>
<tr>
<td></td>
<td>(3.2)</td>
<td>(3.6)</td>
<td>(6.1)</td>
<td>(4.0)</td>
<td>[8.5 %]</td>
</tr>
<tr>
<td>Staff development</td>
<td>2.8</td>
<td>1.8</td>
<td>4.2</td>
<td>4.5</td>
<td>3.3 (4.0)</td>
</tr>
<tr>
<td></td>
<td>(3.4)</td>
<td>(1.7)</td>
<td>(5.0)</td>
<td>(3.3)</td>
<td>[4.1 %]</td>
</tr>
<tr>
<td>Injury prevention</td>
<td>5.4</td>
<td>4.6</td>
<td>9.1</td>
<td>12.2</td>
<td>7.8 (6.0)</td>
</tr>
<tr>
<td></td>
<td>(0.8)</td>
<td>(2.5)</td>
<td>(6.7)</td>
<td>(12.9)</td>
<td>[9.9 %]</td>
</tr>
<tr>
<td>Injury treatment / Rehab.</td>
<td>44.7</td>
<td>32.5</td>
<td>43.7</td>
<td>31.3</td>
<td>38.1 (15.1)</td>
</tr>
<tr>
<td></td>
<td>(13.5)</td>
<td>(18.8)</td>
<td>(12.7)</td>
<td>(6.6)</td>
<td>[48.2 %]</td>
</tr>
<tr>
<td>Travel time</td>
<td>14.0</td>
<td>14.0</td>
<td>17.8</td>
<td>14.0</td>
<td>14.9 (10.1)</td>
</tr>
<tr>
<td></td>
<td>(4.8)</td>
<td>(6.4)</td>
<td>(16.9)</td>
<td>(4.6)</td>
<td>[18.9 %]</td>
</tr>
<tr>
<td>Other (prep. time, advice,</td>
<td>9.1</td>
<td>6.4</td>
<td>10.4</td>
<td>7.2</td>
<td>8.2 (6.3)</td>
</tr>
<tr>
<td>match attendance</td>
<td>(7.9)</td>
<td>(5.5)</td>
<td>(6.6)</td>
<td>(4.9)</td>
<td>[10.4 %]</td>
</tr>
<tr>
<td>TOTAL</td>
<td>82.7</td>
<td>65.9</td>
<td>91.9</td>
<td>75.9</td>
<td>79.0</td>
</tr>
<tr>
<td></td>
<td>(9.2)</td>
<td>(17.9)</td>
<td>(40.9)</td>
<td>(15.5)</td>
<td>(27.0)</td>
</tr>
</tbody>
</table>
Figure 4.16. Proportion of total work time (%) spent during injury prevention and injury treatment / rehabilitation and all other tasks by senior physiotherapists.
4.4 DISCUSSION

The aim of the present study was to assess the injury prevention, treatment and rehabilitation resources available at professional football clubs. The level of support services within a football club can contribute to the level and consequences of injury risk. By benchmarking the support services, an appropriate health and safety strategy can be developed and assessed for the players based on current standards and economic limitations.

An essential element of the management of these resources is the employment of qualified, experienced staff to deliver the relevant injury prevention and treatment techniques through the use of safe and effective facilities. It has been a long standing tradition for professional football clubs to provide these resources through the physiotherapist and coaches, but with the growth and benefits of sports science application, it has become increasingly recognised that it is important to employ specialists to provide services to complement the physiotherapist (Lynch and Carcasona, 1994).

4.4.1 Audit questionnaire response

The total response rate for this survey (40%) is very similar to other questionnaire based survey work carried out with professional football clubs. Fuller and Hawkins (1997) surveyed professional football safety officers with respect to ground conditions and received a response rate of 40%. Hawkins and Fuller (1998) surveyed English professional footballers at five English professional clubs with respect to awareness of injury prevention strategies and obtained a response rate of 38%. Within the business and financial sector, Arnold and Benveniste (1988) surveyed football club financial directors and reported a response rate that was quoted as exceeding 40%. More recently, Waddington et al (1999) received a response rate of 64% from football club doctors.

As a comparison, Storey (1994) provides a summary table of questionnaire response rates from the small business sector (mean: 22.9%; range: 8.0% - 32.9%; N= 7). The response rate within this survey was therefore nearly twice that received for surveys in other small / medium businesses and provides sufficient evidence to be recognised as an acceptable return rate. Personal communications and comments from physiotherapists, who returned the survey questionnaire without completing the survey items, indicated lack of time as the prime reason for failure to complete the details.
4.4.2 Physiotherapy support

The results presented in Figure 4.3 show that Premier league football clubs employ both a greater number and more highly qualified physiotherapists than all other Divisions. However, the average number of professionals employed by Premier clubs (40) is greater than clubs in the 1st (32), 2nd (26) and 3rd (22) Division clubs (Football League Ltd., 1998). These figures give ratios of physiotherapists (full time or part time) to players of 1: 12.8 (Premier), 1: 18.7 (1st Division), 1: 18.3 (2nd Division), 1: 19.3 (3rd Division). Therefore, Premier clubs have a greater provision of physiotherapy support per player than all other Divisions. However, this falls significantly below the ratio of 1: 8 reported for Italian Serie A clubs (Curry, 1997).

The present study has also shown that whilst senior physiotherapists generally provide cover to all team squads within the club during training (> 88%), only 50% of the senior physiotherapists are present at reserve team games and 13% at youth team games. Physiotherapy cover at competitive matches in reserve and youth matches is generally provided by other employed physiotherapy staff. Of concern is the fact that one 2nd and one 3rd Division club provided no physiotherapy support during training for the youth sides. One Premier League club and two 3rd Division clubs provided no physiotherapy support during reserve and youth matches, despite the majority of injuries in professional football occurring during matches (Lewin, 1989; McGregor & Rae, 1996; Hawkins & Fuller, 1999). In a number of instances leagues clubs relied on the home side, to provide physiotherapy support for youth teams during away matches. At three Italian Serie A clubs, no youth training session or competitive matches commenced without a specialist medical practitioner being present (Curry, 1997). The importance of this issue has already been identified and addressed by the Football Association (FA) in their Youth Academy programme (Wilkinson, 1997) where it was proposed that all clubs should provide one chartered physiotherapist for the 8-16 year age group and a second chartered physiotherapist for the 16-21 year age group of players.

Although qualifications are an essential and integral part of being a professional football club physiotherapist, experience is an equally relevant consideration for the job. Understanding the specific attitudes and personalities of professional footballers ensures players' recovery times can be minimised. On average, physiotherapists had nearly ten years contact with professional footballers and nearly five years of this time was with their existing clubs. It can be beneficial to professional football clubs that some of the physiotherapists are ex-professional footballers and they therefore have a specific understanding of players' problems and needs. However, this experience must not cloud their clinical judgements in the assessment and rehabilitation of players' injuries. Evidence currently suggests that this is the case (Waddington et al, 1999)
and it would therefore hinder clinical judgements made by the physiotherapists. Appropriate qualifications are still the most important pre-requisite for the provision of medical support within the club (Waddington et al, 1999).

The greater reliance of Third Division clubs on physiotherapists with diploma qualifications may eventually make these clubs vulnerable in civil cases of negligence. Less qualified personnel might well have good intentions, and enjoy their involvement in their sport but good clinical practices, and records, are essential requirements within professional sport physiotherapy (Macauley, 1998; Fuller and Hawkins, 1997).

Developments in the Premier League now ensure that new physiotherapists must be qualified to Chartered status. If they were employed prior to the 1998/99 season, they must have undertaken the F.A. Diploma Treatment of Injury Course. After the start of the 2000/2001 season, all new and existing physiotherapists must also hold the F.A. Post-Graduate Certificate in Football Sports Medicine. This national standard should ensure standards in football are maintained at the highest level. The new standards also state that each club physiotherapist shall undertake a minimum of 36 hours continuing professional development, of which 18 hours must be provided by the FA either directly or by means of formally approved courses. A record of this course attendance has to be kept for inspection by an officer of the League on demand (Premier League, 1998).

4.4.3 Injury treatment and rehabilitation

In assessing facility provisions for injury treatment and rehabilitation, the present study has indicated that there is no significant difference between divisions for the availability of injury assessment tools, Figure 4.4, therapeutic modalities, Figure 4.5, cardiovascular equipment, Figure 4.6, or resistance equipment, Figure 4.7. For therapeutic modalities, Premier League clubs tended to provide a wider range of facilities than other Divisions, although the trend to use modalities as an adjunct to manual therapy makes these differences less important. Whilst the audited list of facilities is not exclusive, the results indicate that all professional football clubs have access to adequate facilities so that professional footballers can be treated and rehabilitated from injury. Although it is accepted that all clubs can obtain access to all these facilities if required, the relative ease of access i.e. availability at the club, specialist injury clinic or hospital, will depend on the level of provision made by individual clubs and their contributions to private medical plans.
Analysis of the availability of specific facilities has revealed that some differences do exist across Divisions e.g. the availability of megapulse, isokinetic machines, x-ray facilities and swimming pools. The differences were primarily related to Premier League clubs, which had greater access to modern or more expensive equipment. However, Premier clubs made less use of this equipment during specific rehabilitation techniques e.g. isokinetic and muscle imbalance testing compared to Division 1 and 2 clubs. The present study indicates that this could be due to a lack of time available to physiotherapists, Table 4.6.

In general, physiotherapy techniques for use during the three stages of injury treatment and rehabilitation were available to all clubs, Table 4.5. Once again, there is a tendency for 3rd Division clubs to have a smaller range of techniques available for injury rehabilitation but this result was non-significant. The ranges of techniques available for injury prevention were also available to all clubs when related to muscular, Figure 4.14, or cardiovascular conditioning, Figure 4.15. It would be expected that facility and technique usage would be related in some form and the evidence from the present study would tend to support this, as the majority of clubs have a wide range of injury treatment / rehabilitation and injury prevention facilities and hence techniques.

The availability of injury treatment / rehabilitation specialists, Figure 4.11, to professional football clubs indicates that Premier and 1st Division clubs have access to a wider range of specialists than Division 2 and 3 clubs. Any differences between Divisions were small. Of specific interest was the use of psychologists within clubs. The number of clubs using sports psychologists to influence the mental aspects of recovery during the injury treatment/rehabilitation process was relatively small. This is despite recognition of the potential benefits of using such strategies during the injury treatment and rehabilitation process (Sanderson, 1996; Gilbourne, 1996).

4.4.4 Injury prevention

In assessing injury prevention, the audit of facilities was primarily concerned with the availability of cardiovascular and resistance equipment, Table 4.1. There were generally no significant differences across Divisions, Figures 4.6 and 4.7, but specific differences in availability were observed for isokinetic machines and swimming pools.

Isokinetic machines have been used in assessing hamstring muscle weakness during the pre-season period with Australian Rules footballers (Orchard et al, 1997). It was suggested that by using such methods, players at risk of hamstring muscle strains could be identified and
treated accordingly. This is important because it has been identified that hamstring muscle strains account for 15% of all injuries in English professional football (Hawkins and Fuller, 1999). Paton et al (1989) and Brady et al. (1993) have used isokinetic measures in assessing quadriceps and hamstring torque to identify those factors related to lower limb muscle injury in professional footballers. Division 3 clubs therefore have the least ability to identify these risk factors and reduce the incidence of hamstring and quadriceps muscle strains in their players.

More specific analysis of individual techniques, which can be used during injury prevention strategies, Table 4.3, has indicated that differences existed for those clubs that made use of flexibility and strength work. Third Division clubs had nearly 50% less use of such techniques than Premier League clubs. The use of muscle imbalance techniques also differed between Divisions. In elite football players, joint flexibility, which results from a combination of active joint mobility, ligamentous laxity and muscle tightness, has been identified as a risk factor for injury (Lysens, 1988). Many authors have suggested that stretching and other flexibility exercises lead to reduced injury and improved performance (Nicholas, 1970; Smodlaka, 1979; Glick, 1980). Knee injury has been related to reduced knee extension strength (Ekstrand and Gillquist, 1983). Poulmedis (1988) has also demonstrated that decreased muscular strength in the hamstrings or quadriceps predisposed the thigh to muscular injuries. A significant correlation was reported for the hamstring / quadriceps strength ratio and the incidence of muscular strains. Despite this strong evidence, the present study indicates that professional football clubs were not using the techniques of strength and flexibility training at a sufficiently high level. The low use of these injury prevention techniques by Third Division clubs could be due to the lower availability of sports science support, Figure 4.8, or the lower level of physiotherapist qualification, Figure 4.3, and specific knowledge. A chartered physiotherapist would have completed a 3 - 4 year full-time degree level course compared to diploma qualified physiotherapists who have studied part-time over two years by distance learning.

The assessment of the provision of additional specialist support staff, Table 4.2, has revealed deficiencies in terms of injury prevention, Figure 4.10. The low level of support for injury prevention compared to injury treatment within professional football clubs helps to explain the preliminary results of Hawkins and Fuller (1998), who reported a low level of awareness of injury prevention strategies by professional footballers. Therefore, despite professional football clubs providing a high level of facilities, Figures 4.6 and 4.7, and physiotherapy techniques, Table 4.6, it was apparent that clubs do not have sufficient qualified personnel, Figures 4.3 and 4.10, to provide the services to their players. Analysis of European clubs and
one South American club, indicated that sports science support, in the form of a dietician, fitness advisor or masseur was evident among their service provision (Wilkinson, 1997; Curry, 1997). A more recent survey by the Four Four Two magazine for the season 1998/99 however, indicated that of the nineteen clubs who replied, fifteen currently employed a fitness specialist (Morgan, 1999). There is controversy however as to what enables an individual to qualify as a fitness specialist due to the variety of experience and qualifications of fitness specialists. To establish consistency across the professional leagues, the F.A. are currently setting up a postgraduate qualification for individuals who wish to work in professional football clubs.

The present study has established that clubs have the necessary facilities and techniques available to minimise the risk of injury to players. Regulation 6 of the MHSW Regulations (1992) also requires employers to appoint suitable competent persons and ensure they have arrangements for using these facilities and techniques. The person/s employed must have sufficient training and experience or knowledge to enable them to assist in undertaking the appropriate injury prevention measures. Competence does not depend solely on the possession of particular skills or qualifications. It requires an understanding of current best practices and a willingness to supplement existing experience and knowledge through training and development and the use of appropriate specialists. The specialists employed must be aware of the risks involved, the principles of risk assessment and injury prevention, an awareness of the aetiological factors related to injury in professional football and the best ways to reduce such factors.

It is unlikely that existing personnel within professional football clubs, including physiotherapists, can offer the level of advice required on nutrition, fitness, psychology or biomechanics. For example, in Australia, physiotherapists have indicated that they desire greater awareness of psychological strategies due to their lack of knowledge in this area (Ford and Gordon, 1997). Professional football clubs should recognise the benefits that specialist sports science support can offer in terms of risk management. In addition to their lack of training in sports science, physiotherapists are restricted by their existing work schedules, Table 4.6.

Club coaches should provide the first line of contact for players in injury prevention. Education for coaches, obtained through the F.A. courses, introduced in 1996, only covers the basic scientific information relevant to football. These courses are of insufficient depth and application to prepare coaches for the required instruction and application of injury prevention strategies. The current modules provide minimal tuition on each of the specialist
areas of fitness in football, nutrition, psychology, and child development. Personal communications with teaching personnel on the F.A. coaching courses indicate that many professional football coaches that attend the coaching courses (approx. 70% of clubs are represented) leave the courses poorly educated in terms of injury prevention strategies and their practical implementation.

Elsewhere, Nixon (1994) assessed coaches views on risk, pain, and injury within sport and showed that two out of three coaches supported the idea of risk taking, playing injured players and rejecting the limits of pain. Although this assessment was carried out with American coaches covering a variety of sports, the findings also apply to English coaches. For example, in a recent Premier League fixture between Manchester United F.C. and West Ham F.C., Harry Redknapp, the WHFC manager was faced with a selection problem over his strikers. Having lost Ian Wright through injury and Samassi Abou through illness, Jon Hartson (his only other recognised striker) opted for a pain killing injection to play in the game. Redknapp commented that Hartson’s action was ‘a rarity nowadays...he showed a lot of character.... a throwback to the old days,’ thereby demonstrating his ignorance of the increased risks of chronic injury (Winter, 1998b). The data of Waddington et al (1999) also indicate that this was not a rarity but a commonplace occurrence. These ideas are continually conveyed through the media, who contribute to the willingness of athletes to risk their health to play high-level sports (Nixon, 1993).

Hence, the delivery of injury prevention strategies within professional football clubs is limited because coaches currently lack the specific knowledge. The physiotherapists, despite having some relevant ideas and knowledge, are severely restricted by their time and existing job roles. This delivery of injury prevention programmes is not just an English or professional football issue. A recent survey conducted across Europe, suggested that the attention paid to injury prevention programmes from 86 sporting and medical organisations across Europe was also sparse (Watson and Hekkink, 1998).

The tendency for Premier and 1st Division clubs to have greater access to specialists is primarily due to the costs of these additional staff. The growing financial gap between Premier League and 1st, 2nd and 3rd Division clubs (Boon et al, 1999) explains why many clubs are inhibited in paying for such services when they cannot perceive an immediate return on the investment. Clubs with greater income are more likely to provide long-term injury prevention services than those clubs facing short-term bankruptcy. This view is not apparent in the Italian Serie A, where despite a 21% lower turnover than the English Premier League (Marchesi, 1998), investment in support services is still high (Curry, 1997; Wilkinson, 1997).
However, economic factors may not be the only determinant for the different approach in the Premier League compared to the Italian Serie A. In his review of the methods used by Italian clubs in the development of players as professional footballers, Curry (1997) identified that the emphasis on academic, personal and sports specific educational development of young players accounted for an integral difference between the top English and Italian leagues. Consequently, a greater investment was needed to integrate this process through the club, to help players develop appropriate habits, e.g. nutritional habits and to help them handle the demands of representing the club as a professional sportsperson in public.

This pre-existing social, political and cultural emphasis is also witnessed in the migration of soccer players through the European transfer system (Maguire and Stead, 1998). The arrangements in the Italian Serie A are seen as a far more attractive employment proposition to the top Dutch and Nordic/Scandinavian players, who have the qualities of high educational standards, language competencies, and an aptitude for settling into new cultures. Their playing styles are also adaptable, offering power and strength with a high level of technical ability (Maguire and Stead, 1998). This argument is supported by the dearth of English born soccer players representing Italian clubs and vice-versa. Although there have been changes in recent years, the major factors for a small number of high profile Italian players playing for the top English clubs have been the lucrative contracts and existing management connections from Serie A (Maguire and Stead, 1998).

In addition to assessing the availability of medical and sports science specialists, their use during training and competitive matches was also audited, Figures 4.12 - 4.15. Premier clubs again provided a significantly greater level of medical and sports science cover than all other Divisions. Other important findings illustrated differences in medical and sports sciences cover for the first team compared to the youth sides, Figures 4.12 to 4.15, Table 4.6. It is likely that this statistic will gradually change as professional clubs move towards the F.A. academy system for youth players, although only one-third of English professional clubs are currently registered as academies. For a club to be accepted onto the academy scheme, additional medical cover is required for the youth players (Wilkinson, 1997). The additional physiotherapy support promised by the academy system should release time for the current physiotherapists to implement injury prevention strategies and screening within the club's programme. Where clubs did not have a second physiotherapist for availability during training for any of the squads, the club doctor tended to be available to help where required.

The pattern for medical cover was replicated with the sports science specialists. Again, Premier clubs had a greater use of sports science specialists for the first team during training,
Figure 4.13, but this level was not available for the reserve or youth teams in any of the Divisions. Furthermore, there were a number of clubs in all Divisions in both training and during competitive matches, where no sports science support was provided. The data illustrates that professional football clubs are more geared towards injury treatment through the provision, availability and use of medical specialists than injury prevention. The importance of injury prevention seems to be poorly understood, with on average only 49% of clubs across all Divisions providing sports science support of any form during first team training. There are even less clubs with support for the first team (37%) and youth squads (31%) during training. In competitive matches, with the exception of the first team squad, the number of clubs providing sports science support decreased to 15% for reserve and 12% for youth squads.

4.4.5 The employment tasks of the football club physiotherapist and injury prevention

The senior physiotherapists within professional football clubs work on average 80 hours per week, Table 4.6. The majority of time is spent in injury treatment / rehabilitation (48%) but it is clear that other tasks also dominate their work proceedings. Various administration tasks and travelling also contribute to 42% of a physiotherapist’s working week. As such, the physiotherapist has very little time to work on injury prevention strategies with the players (10%), Figure 4.16. This is despite the fact that within the club, the physiotherapist is the most likely person to have the knowledge and skills to transfer this information to the players. Consequently, physiotherapists have little time to work on injury prevention strategies with their players although most are expected to do so as part of their job function. Curry (1997) succinctly describes the difference between the management approaches in Italian and English clubs: “Within every (Italian) club there are specialists. The masseur massages, the physiotherapist treats, the doctor dispenses, the fitness trainer keeps them fit, the coaches coach”. Whilst physiotherapists at English clubs are expected to carry out non-prevention, treatment/rehabilitation tasks, English clubs will continue to lag behind their European counterparts in this area.

Third Division club physiotherapists had the lowest ratio (1: 2.1: 2.0) for time spent in injury prevention: injury treatment / rehabilitation: other tasks. This ratio gradually increased for 2nd Division (1.0: 4.5: 2.0), 1st Division (1.0: 6.0: 6.0) and Premier League physiotherapists (1.0: 9.0: 6.0). When the ratio of average number of players to number of hours worked by the senior physiotherapist was considered, Premier and 1st Division club physiotherapists tend to have less available time per player (Premier: 2.1 hrs / player, 1st Division: 2.1 hrs / player) than 2nd and 3rd Division clubs (2nd Division: 3.5 hrs / player, 3rd Division 3.5 hrs / player)
although this was compensated for by the greater number of physiotherapists available for Premier League clubs. The variable distribution of working patterns by physiotherapists across Division may be related to the employment of injury prevention specialists within professional football clubs. The data tend to indicate that there is a relationship between the number of clubs with greater availability of injury prevention specialists and the quantity of time that the football club physiotherapists spend on injury treatment.

4.4.6 Youth provision at professional football clubs

A recent publication by the F.A. ‘Charter for Quality’ (Wilkinson, 1997) has outlined proposals for the development of elite football academies within professional football clubs. Within these proposals there are specific guidelines for the medical support. The present study has illustrated that existing medical cover for the youth teams within professional football clubs is always less than the first teams, Figures 4.12 and 4.14. Despite being the ‘future’ of the club it is evident that clubs do not perceive that youth players require medical cover to the levels of the first team players.

The level of sports sciences cover for the youth sides were also significantly less than the first team. The F.A. ‘Charter for Quality’ does not address this issue in as much detail as for medical cover within the academies (Wilkinson, 1997). Clubs are given free rein as to the sports science specialists they employ and the salaries they pay. It is anticipated that this will change as clubs move towards the FA’s Academy system for youth players. The FA has recommended that a sports science support programme should be established for youth players in the academy programme covering nutrition, fitness, physiology and psychology (Wilkinson, 1997). The additional physiotherapy support, promised by the academy system could also release time for current physiotherapists to implement injury prevention strategies for their senior professional players, where specialist advisers are not available. The medical cover proposed within the academies is still small compared to the financial investments, coaching staff and medical specialists employed in elite clubs across Europe and South America (Wilkinson, 1997). Youth sides from selected clubs in Holland (Ajax), Spain (Barcelona), Italy (Parma, Inter Milan) and Brazil (Sao Paulo) (Wilkinson, 1997) were shown to far exceed the medical cover of English clubs audited within the present study.
4.5 CONCLUSIONS

The present study has provided information on the support service provision for the purposes of injury treatment / rehabilitation and injury prevention within professional football clubs. The provision of facilities, techniques and support staff for injury treatment and rehabilitation was sufficiently provided for at the majority of professional football clubs. Facility and technique availability for injury prevention purposes was also adequately catered for. This would be expected because facility availability will determine the treatment and rehabilitation techniques available for use. Many of the facilities that are available at clubs also have dual uses for both injury treatment / rehabilitation and injury prevention.

The main deficiency in support services was the availability of injury prevention specialists and the availability of personnel who could educate and deliver injury prevention strategies. The fact that clubs have the necessary facilities and techniques available for minimising the risk of injury to players, but a deficiency in appropriately trained support staff is contrary to requirements under UK health and safety legislation. Regulation 6 of the MHSW Regulations (1992) requires employers to have access to sufficient competent help to devise and apply injury prevention strategies.

It can be argued that the delivery of such support services is already held within the club, yet the work of Hawkins and Fuller (1998) has indicated that players are deficient in their awareness of such strategies and are therefore not being educated in terms of injury prevention. The team coaches are the first lines of education and injury prevention for players, yet it is apparent they are deficient in the appropriate training of injury prevention strategies to recycle to the players. The present study also indicates that it is unreasonable to expect the physiotherapists who have a reasonable knowledge of injury prevention to find the time and to gain suitable access to all players within the club for injury prevention purposes.

The senior club physiotherapist spends on average nearly 80 hours per week to ensure all players receive adequate care and attention, returning to competitive play as soon as possible. Due to demands of the job it was of no surprise to find that nearly 20% of physiotherapists had no time for additional staff development to broaden their knowledge base. For those physiotherapists who did have time to strengthen their knowledge base, an average of 3 hours per week was identified as the typical times for such training. This training tends to occur in the off-season, for example, those organised by the F.A. Medical School at Lilleshall. At a recent FA conference (September, 1998) 36 clubs (39%) were represented by professional football club physiotherapists. The content of physiotherapy training courses however, is
more based on the medical treatment of injuries than on specific injury prevention strategies and their application to the professional football club. If the physiotherapists do increase their knowledge base in injury prevention strategies, they must then find time to translate these ideas into useable programmes for the team coaches, management and players and to ensure that they are implemented into pre-, during and post-season team preparation. Based on the current working regime of physiotherapists this is unlikely to be an achievable goal. It is unreasonable to expect the physiotherapists, as the most educated and knowledgeable staff within a club, to deliver injury prevention strategies to the level required in addition to their other job requirements.

The analysis of physiotherapy demographics has also shown that the level of physiotherapy support was approximately 33% greater in Premier League clubs than Division 1, 2 and 3 clubs. In comparison, Curry (1997) has reported that elite Italian Serie A clubs have an additional 33% of physiotherapy cover for first team players (1:8) compared to the Premier League with standard additional support from a masseur and fitness specialist. This could be one of the key factors why the Italian Serie A clubs continually produce and attract the world's best players to their competitions. With the high level of injury treatment and the specific emphasis on fitness, prevention and recovery of their top players, Italian based clubs are more prepared in terms of risk management for the rigours of professional football.

The level of support for the youth team at professional football clubs was shown to be deficient when considered in terms of both injury treatment/rehabilitation and injury prevention. The FA’s ‘Charter for Quality’ addresses the issue of medical cover by insisting on physiotherapy availability for youth sides before a club can be registered as a football academy (Wilkinson, 1997). The FA academies require one physiotherapist for the 8-16 age group, one physiotherapist for the 16-21 age group, one education and welfare officer with one doctor either on call (if part-time) or with access to the full-time first team doctor (Wilkinson, 1997).

One of the factors why clubs fail to invest in injury prevention specialists is the need for immediate success, which can be obtained through player transfers. The potential growth in income through promotion to the Premier League has led to First Division clubs recording the greatest losses (Boon et al, 1999). However, for Premier League status to be maintained each club must ensure the high levels of income required to ensure performance is of the standard required to compete within the Premier League, Chapters 2 and 3.
The present chapter has benchmarked the current facilities and support services within football clubs and indicated deficiencies that contribute to the injury risk. By identifying these deficiencies the following chapter will outline and assess potential risk control strategies that can reduce the risk of injury. The recommended strategies will ensure that clubs are fulfilling the legal requirements for the health and safety of their employees.
4.5 STRENGTHS AND WEAKNESSES

This study has provided a detailed analysis of equipment and support staff provision within professional football clubs. Many of the findings across Divisions are not surprising, but the study is the first to quantify these differences. In addition, the present study has provided support to previous work by Hawkins and Fuller (1998) in explaining players' deficiencies in their perceptions of injury prevention strategies. The study has illustrated how professional football clubs are failing to meet the requirements of MHSW (1992) regulations in regard to the provision of competent assistance to educate players concerning injury prevention strategies and techniques.

Some of the items discussed within the study were of a retrospective nature. Such studies have been criticised owing to the need for accurate memory recall and the problem of reliability (Phillips, 2000). It is felt however, that because of the large amount of time most physiotherapists spend within their employment and their working patterns, any problems with information recall were likely to be small. The physiotherapists who responded to the audit questionnaire had all been established within their existing club for at least four years.

Although the audit has indicated that professional football clubs have access to specific equipment, techniques and support staff, there was no in-built measure to assess the quality of this equipment provision, experience of using techniques and/or quality/specific experience of the support staff. The specific roles played by support staff within the club were also unknown. It is of little use for qualified fitness advisors to take simple team warm-ups and stretching sessions when individual player surveillance and development programmes form the basis of injury prevention and loss control. These points were considered during the development of the questionnaire document. However, the substantial length of the questionnaire, which took approximately 20 - 30 minutes to complete accurately, precluded the inclusion of further detail, as this would have inhibited the response rate achieved. Future work could therefore focus on the specific issue of quality and the specific job roles of the specialist support staff.

The response rate to the audit document was very similar to other survey documents that have been used in the football industry. The response rate also exceeded responses that have been obtained from other small businesses. To assess whether the sample of respondents was representative of the population, a simple comparative statistical test was used to compare the financial status of respondents and non-respondents. This test illustrated that in terms of financial turnover, which is likely to influence the level of support provision provided to the
players, there was no difference in the sample and those non-respondents. Furthermore, the conclusions are generally in agreement with a complementary survey undertaken with club doctors and physiotherapists (Waddington et al, 1999).
CHAPTER FIVE
A COST BENEFIT ANALYSIS OF INJURY PREVENTION STRATEGIES IN PROFESSIONAL FOOTBALL

5.1 INTRODUCTION

Chapter 4 indicated that the majority of professional football clubs were deficient in the provision of injury prevention support staff, as measured by the availability of sports science specialists. It also suggested that existing work demands did not permit the club medical team to become actively involved in the provision of injury prevention strategies. In addition, existing coaching staff often does not have the knowledge and awareness to deliver and educate the players in injury prevention. Consequently, for professional football clubs to fulfil their health and safety obligations (MHSW, 1992) the recommendation would be to invest in a specialist to fulfil this role. However, the majority of clubs do not make a profit at the end of the tax year (Boon et al, 1999) and have limited resources to invest or redirect to players health and safety. Therefore, the investment in a specialist must be of sufficient benefit, measured in terms of injury reduction, to justify the costs incurred.

Within industry, any investment programme can be approached using risk management procedures and tools, where the cost of a loss can be compared with the cost of prevention (Health and Safety Executive, 1993). The process of comparing losses against the costs of prevention is termed cost benefit analysis (CBA). It is a method for informing and assisting policymakers in decision making but should not provide the sole method for determining investment decisions (Warner and Luce, 1982; Mishan, 1988). When utilising a cost benefit analysis, the programme being evaluated should only be implemented as long as the benefits exceed or equal costs incurred (Sloan, 1996). There are six basic steps of a CBA, viz., defining the intervention; identifying relevant costs (direct and indirect); identifying relevant benefits (direct and indirect); measuring the costs; measuring the benefits (need to consider discount rates if occurring in future); and accounting for any uncertainties (use sensitivity analysis or Monte Carlo simulation) (Sloan, 1996).

Cost analysis and cost benefit techniques have been used extensively in the health and medical industry to assess the potential of projects within healthcare and to sum the costs of treatment from accidents and injury (Warner and Luce, 1982; Santerre and Neun, 1996; Sloan, 1996; Johnson et al, 1992). Cost-benefit techniques have also been used to assess the
intervention of exercise prescription within sedentary populations (Nicholl et al, 1993; Shephard, 1995). There have been some uses of CBA techniques within sport and sports injury research. Each softball and baseball injury in the US caused by base sliding was estimated to have cost $US1223 (Janda et al, 1992). However, through the installation of breakaway bases, savings of $US2Bn were projected through the reduction of sliding injuries (Janda et al, 1992). Tolpin and Bentkover (1981) calculated the cost of a severe corneal abrasion from ice hockey ($US8216) and the cost of a severe spinal cord injury from American football [$US737,922 (based on 6% discount rate) $US511,869 (based on 10% discount rate)]. Tolpin and Bentkover (1981) then went on to show that investment in protective eye equipment in ice hockey could lead to savings, which exceeded the costs by 317%.

The only costing of injury in football is that of Ekstrand (1982) with Swedish clubs. The cost of injury for the whole of the Swedish Division IV was estimated at 790,000 Swedish Krona. Ekstrand (1982) went on to demonstrate that through a prophylactic benefit programme coordinated by coaches, doctors and physiotherapists, injury costs were reduced by 83%. However, as with the cost analyses associated with sports injuries, limited studies have used CBA in professional sport. There are many differences between amateur and professional sport, which will alter the ratio between the potential costs and benefits associated with athlete injury. Professional sportspeople incur costs through medical and career ending insurance cover, treatment times and through the loss of benefit associated with their salary and bonuses. Therefore, the primary aim of this chapter is to produce a cost benefit analysis for the investment of health and safety support services within professional football clubs. A secondary aim is to apply the concepts of cost benefit analysis to a Premier League football club, which does not currently have an injury prevention specialist as part of its medical support staff.
Chapter 5: Cost benefit analysis of injury prevention strategies

5.2 METHOD

PART A: General application

5.2.1 Structure of cost benefit analysis

Figure 5.1 illustrates the structure used to calculate the costs of injury and the cost benefit analysis of investment of an injury prevention specialist by a professional football club.

![Cost-Benefit Analysis Diagram](image)

Figure 5.1. Structure for determining the CBA for injury prevention services in professional football clubs

In the present chapter, precedence was given to obtaining precise details on the direct medical and salary costs of injury in professional football. The costs of all types of injury across a
typical season were calculated using the epidemiological data analysis from Chapter three, which provides details on the risks to professional clubs in terms of number of days of absence. The days of absence were subdivided into four injury categories corresponding to player absence of one to three days (slight), four to seven days (minor), one week to one month (moderate), or greater than one month (major), respectively (Hawkins and Fuller, 1999).

5.2.2 Direct costs and benefits

Data on player salaries were accessible through the Football and Premier League. The information used in the present study was based on salaries from the season 1996 / 1997 (Football League Ltd. 1998, personal communication). To update this financial information to a single time point, Boon et al (1999) provide an indication of the salary increases for players after the season 1996/97.

Details on medical costs, e.g. medical cover options and costs, consumables and equipment, were obtained through two physiotherapists, currently employed at professional football clubs. The typical costs for private medical cover (Amber Light Insurance, 1998, personal communication) and career ending insurance (Liberty Re, 1998, personal communication) were obtained from private insurance companies that currently provide services to professional football clubs. Other additional costs e.g. staffing, consumables were obtained from two club physiotherapists.

Calculating mean physiotherapy injury treatment/rehabilitation time

Details on the senior physiotherapists work schedules, Chapter 4, were used to estimate the quantity of time spent in injury treatment / rehabilitation per day. It was assumed that the time spent dealing with non-injured players e.g. applying strapping or treating blisters was insignificant compared to this time. In addition to this information, the typical number of players injured at any time and their mean duration of absence were based on epidemiological studies by Lewin (1989), McGregor and Rae (1995) and Hawkins and Fuller (1999).
Physiotherapy costs

The F.A. keeps a record of the salary ranges with professional football club physiotherapists (Football Association Medical Centre, 1998, personal communication). By combining total treatment time with hourly costs for physiotherapy services, the total costs for the medical treatment were calculated. The typical salaries for physiotherapists, as a function of division, were calculated using criteria of physiotherapist’s qualifications and the number of physiotherapists at each club, Chapter 4. Greater value was given to physiotherapists who held the chartered status qualification compared to the diploma qualification. It was assumed that the costs associated with employment of an injury prevention specialist would be similar to those calculated for the physiotherapists.

5.2.3 Indirect costs and benefits

To calculate the indirect costs of player injury and the potential benefits from a reduction of injury risk, the risk framework model, Chapter 2, was adopted to illustrate the potential playing and financial performance benefits from a reduced player absence rate.

PART B: Case study of a Premier League football club

5.2.4. Data collection

Player injuries were prospectively reported from July 1993 through to the end of the 1997/98 playing season. All professional players were involved within the study but only those players that represented the first team for at least one single competitive match were included within the analysis. All injuries were diagnosed by the same physiotherapist and recorded on an injury report form. The details extracted from the injury form included:

- Injury severity
- Number of days absent
- Re-injuries
- Playing season

As the same physiotherapist diagnosed all of the injuries, it was assumed that injuries were reported consistently. In some instances, MRI scans and expert opinion were used to confirm
and identify the injury diagnosis. Of the data recorded by the physiotherapist only those injuries which ‘were received during normal practice or a competitive game and prevented the injured party from participating in normal practice for at least one day, not including the day of the injury’ (Hawkins and Fuller, 1999) were used during the analysis. Any absentees due to illness or injury not resulting from practice or matches, e.g. at home, were not included within the study. A re-injury was defined as an injury which occurred within two months of the initial injury or if there were residual symptoms from a past injury (Ekstrand and Gillquist, 1983). The severity of an injury was defined as ‘slight’, ‘minor’, ‘moderate’ or ‘major’ depending on whether the player was absent from play for one to three days, four to seven days, one week to one month, or greater than one month, respectively (Hawkins and Fuller, 1999).

Injury costs and the application of the cost-benefit analysis were applied using the methodology described in sections 5.2.1 to 5.2.3. The playing and financial performance of the club during the analysis period was extracted from the Annual Reviews of Football Finance (Barton et al, 1997; 1998; Boon et al, 1994; Boon et al. 1995; 1999 Thorpe et al, 1996).
Chapter 5: Cost benefit analysis of injury prevention strategies

5.3 RESULTS

PART A: General application

5.3.1 Calculation of injury severity and classification

The mean duration of absence for slight, minor, moderate and major injuries was 2.7 ± 1.1, 6.0 ± 4.0, 13.8 ± 6.0, 55.7 ± 43.4 days, respectively. On average, slight, minor, moderate and major injuries accounted for 16.5%, 34.8%, 37.0% and 11.7% of all injuries, respectively. These figures were used in calculating the typical costs for injury treatment and rehabilitation for part A.

5.3.2 Direct costs of injury

All of the costs presented in the results apply to the playing season 1997/98 to coincide with the financial data available and the injury risk data presented in Chapter 3.

Insurance cover

For more serious injuries where surgery and consultations are required, professional football clubs have private medical insurance to cover costs. These costs will vary according to a number of club factors, e.g., London or Provincial location, previous claims history, and the squad size. The medical cover includes costs associated with accommodation e.g., bed, food, nursing; blood tests, pathology and outpatients services e.g., MRI scans, x-rays (Amber Light Insurance, 1998, personal communication).

For a squad of fifty players, the typical cost of insurance cover is quoted at £1200 to £1400 per player per year (Amber Light Insurance, 1998, personal communication). The typical costs for clubs, as a function of playing Division, are shown in Table 5.1. These costs do not allow for the fact that some clubs underwrite the risks associated with certain players, who have specific injury problems, in order to reduce the size of the insurance premium.
Table 5.1. Annual private medical insurance costs by Division (personal communication, Amber Light Insurance)

<table>
<thead>
<tr>
<th></th>
<th>Premier</th>
<th>Division 1</th>
<th>Division 2</th>
<th>Division 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average no. squad players</td>
<td>40</td>
<td>32</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>Cost per player</td>
<td>£1300</td>
<td>£1300</td>
<td>£1300</td>
<td>£1300</td>
</tr>
<tr>
<td>Total medical cover / team / year</td>
<td>£52000</td>
<td>£41600</td>
<td>£33800</td>
<td>£28600</td>
</tr>
</tbody>
</table>

From the audit results reported in Chapter 4, physiotherapists indicated that extra staff support was not used during the injury treatment and rehabilitation of a footballer. Hence, no extra costs were incurred for additional staff, and the costs for consumables e.g. tape, supports, are assumed minimal to these direct costs.

Professional football clubs have private insurance to provide cover for a career ending injury to their players. Generally, premiums are based on age and level of cover (essential or comprehensive). Underwriters have exclusion clauses based on a player’s previous injury history. The cost to a club, considering all of these factors, is approximately six percent of a player’s salary per year (Liberty Re Ltd, 1998, personal communication). The typical costs of career ending injury insurance based on the factors of squad size and salaries are shown in Table 5.2.

Table 5.2. Annual cost of career ending injury insurance cover by Division

<table>
<thead>
<tr>
<th>Division</th>
<th>Average salary / player (£000's)</th>
<th>Cost per player / year (£)</th>
<th>Cost per player / day (£)</th>
<th>Cost per club / yr. (£000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier</td>
<td>213.4</td>
<td>13884</td>
<td>38.0</td>
<td>555.4</td>
</tr>
<tr>
<td>Division 1</td>
<td>78.0</td>
<td>4680</td>
<td>12.8</td>
<td>149.8</td>
</tr>
<tr>
<td>Division 2</td>
<td>41.1</td>
<td>2467</td>
<td>6.8</td>
<td>64.1</td>
</tr>
<tr>
<td>Division 3</td>
<td>24.5</td>
<td>1469</td>
<td>4.0</td>
<td>32.3</td>
</tr>
</tbody>
</table>

Physiotherapy costs during injury treatment and rehabilitation

Table 5.3 shows the average number of days absent per injury. This information was required to calculate the number of players injured at any one time, which the physiotherapist would be required to treat.
Table 5.3. Average number of days absent through injury

<table>
<thead>
<tr>
<th>Author</th>
<th>Total days lost</th>
<th>Total injuries</th>
<th>Average number of days absent per injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkins and Fuller (1999)</td>
<td>8644</td>
<td>587</td>
<td>14.7</td>
</tr>
<tr>
<td>McGregor and Rae (1996)</td>
<td>2551</td>
<td>94</td>
<td>27.1</td>
</tr>
<tr>
<td>Lewin (1989)</td>
<td>1102</td>
<td>66</td>
<td>16.7</td>
</tr>
<tr>
<td>MEAN (Reported values)</td>
<td></td>
<td></td>
<td>19.5</td>
</tr>
</tbody>
</table>

In addition to this information, the typical number of players injured during a season was obtained, Table 5.4.

Table 5.4. Average number of squad players injured per season (%)

<table>
<thead>
<tr>
<th>Author</th>
<th>Average number of players injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkins and Fuller (1999)</td>
<td>86 - 100 % (4 clubs over 2 seasons)</td>
</tr>
<tr>
<td>McGregor and Rae (1996)</td>
<td>71 - 79 % (1 club over 3 seasons)</td>
</tr>
<tr>
<td>Lewin (1989)</td>
<td>91 % (1 club over 1 season)</td>
</tr>
</tbody>
</table>

As the numbers of players injured per season was so high, it was assumed that all players in the squad (100%) were injured at some point during the season. To complete the estimates for a physiotherapist’s work schedule, the typical number of injuries per week for each club, according to division, were calculated. This calculation was important because each club, according to division, has a different number of squad players (Football League Ltd, personal communication), physiotherapists and available time for injury treatment and rehabilitation, Chapter 4.

From the epidemiological information provided by Lewin (1989), McGregor and Rae (1996) and Hawkins and Fuller (1999) the average number of injuries per player per season was 2.7, 1.2 and 1.5, respectively, which equated on average to 1.8 injuries, per player, per season. Over a typical season therefore, a Premier League, First, Second, and Third Division football club would typically expect 72, 58, 47 and 40 injuries per season.
Table 5.5 shows the mean time available for injury treatment and rehabilitation per player, calculated from the physiotherapists' working schedules presented in Chapter 4.

Table 5.5. Average time spent on treatment and rehabilitation per injured player by physiotherapists (playing season 1997 / 98)

<table>
<thead>
<tr>
<th>League</th>
<th>Total time spent on injury treatment per day (hrs)</th>
<th>Injuries per week</th>
<th>Typical treatment time per player per day (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier</td>
<td>9.8</td>
<td>1.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Division 1</td>
<td>8.3</td>
<td>1.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Division 2</td>
<td>8.7</td>
<td>0.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Division 3</td>
<td>5.0</td>
<td>0.8</td>
<td>2.5</td>
</tr>
</tbody>
</table>

To calculate the physiotherapist’s treatment schedule, previous calculations and assumptions showed that there would be between 0.8 – 1.4 injuries every week lasting on average 19.5 days. By comparing the physiotherapists’ work schedule, Table 5.5, with the typical number of players injured on a weekly basis, the average time spent by the physiotherapist with each player was obtained. This calculation assumes that the time spent dealing with minor complaints with other players who are not absent from play will not significantly influence the overall treatment time. Figure 5.2 shows the typical treatment schedule for a Premier League physiotherapist from the start of pre-season. By the third week of the season, the treatment demands of the physiotherapist would typically be four players every week. As lower division sides have fewer players, this treatment requirement was calculated as three players per week for First and Second division football clubs, and two players per week for Third division clubs.
Figure 5.2. Typical injury treatment and rehabilitation schedule for a Premier League club (playing season 1997/98)

The product of the physiotherapy pay (per hour) and quantity of time spent per injury provided an estimate of the cost of the physiotherapist to the injury treatment and rehabilitation. The range of physiotherapy salaries for all Football and Premier League clubs was £21,500 to £47,500 (F.A. Medical Centre, 1998, personal communication). There were physiotherapists with different qualifications across and within the leagues, Chapter 4, which was assumed to determine the salary paid to the physiotherapist. Based on this assumption, all chartered physiotherapists were allocated the top half of the stated range of salary i.e. £34,500 to £47,500, and diploma qualified physiotherapists were allocated the bottom half of this range i.e. £21,500 to £34,500. The midranges of each of these subsections were used as typical average salary ranges for chartered (£41,000) and diploma qualified physiotherapists (£28,000). Average salaries according to qualification and proportion of chartered and diploma physiotherapists across division, Chapter 4, were calculated and equated to an hourly rate, Table 5.6. The hourly rate was based on the typical number of hours working per week, Table 4.6.
Table 5.6. Equated average hourly rates (£) for physiotherapy services  
(playing season 1997/98)

<table>
<thead>
<tr>
<th>Division</th>
<th>% FTE* Chartered physios</th>
<th>% FTE* Diploma physios</th>
<th>Equivalent average salary (£)</th>
<th>Equivalent average hourly cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier</td>
<td>82 %</td>
<td>18 %</td>
<td>38660</td>
<td>£9</td>
</tr>
<tr>
<td>Division 1</td>
<td>57 %</td>
<td>43 %</td>
<td>35410</td>
<td>£10</td>
</tr>
<tr>
<td>Division 2</td>
<td>79 %</td>
<td>21 %</td>
<td>38270</td>
<td>£8</td>
</tr>
<tr>
<td>Division 3</td>
<td>22 %</td>
<td>78 %</td>
<td>30860</td>
<td>£8</td>
</tr>
</tbody>
</table>

* FTE: Full time equivalents

The average physiotherapist treatment costs based on the figures presented in Tables 5.5 and 5.6, for each severity of injury are shown in Figure 5.3.

Figure 5.3. Average cost of physiotherapy resources per club / injury as a function of injury severity and division (playing season 1997/98)
Chapter 5: Cost benefit analysis of injury prevention strategies

Salary costs

Typical salaries for professional footballers were obtained from the Football League Ltd (personal communication). The average salaries based on 1997/98 season are shown in Table 5.2. The loss of benefit to the clubs (in terms of salary), according to duration of player absence was calculated for each division, Figure 5.4.

![Chart: Loss of benefit (salary) in salary per season per club due to injury (playing season 1997/98)](image)

Figure 5.4. Average loss of benefit (salary) in salary per season per club due to injury (playing season 1997/98)

Summary of direct costs of injury

Figure 5.5 provides a summary of the typical direct costs to professional football clubs for each injury severity, across division, per season. This figure accounts for physiotherapy care, insurance cover and loss of benefit (expressed as salary) due to player absence during the period of injury.
Capital equipment costs were based on 1997/98 market prices for physiotherapy equipment, cardiovascular and resistance equipment (Physio Med Services, Glossop, Derbyshire). The capital costs of the equipment were depreciated over a five-year period. The equipment included within the cost analysis for each club was based on services provided by clubs for the season 1997 / 98, Chapter 4. There were no significant differences for equipment availability across division, Chapter 4, therefore the same costs were applied to all divisions. The fixed equipment costs equated to £12,000 per year.

5.3.3. Indirect costs of injury

Playing performance

The influence on team-playing performance was calculated for injury reduction rates of 10% (3.9 days), 30% (11.7 days), and 50% (19.5 days) per player, per season. Table 5.7 shows the number of days, per team, equivalent to the stated injury prevention levels, as a function of playing division and injury reduction rate.
Table 5.7. Injury reduction (days) per playing squad as a function of Division and injury reduction rate

<table>
<thead>
<tr>
<th>Injury reduction rate</th>
<th>10 %</th>
<th>30 %</th>
<th>50 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier League</td>
<td>156.0</td>
<td>468.0</td>
<td>780.0</td>
</tr>
<tr>
<td>First Division</td>
<td>124.8</td>
<td>374.4</td>
<td>624.0</td>
</tr>
<tr>
<td>Second Division</td>
<td>101.4</td>
<td>304.2</td>
<td>507.0</td>
</tr>
<tr>
<td>Third Division</td>
<td>85.8</td>
<td>257.4</td>
<td>429.0</td>
</tr>
</tbody>
</table>

Figure 5.6 shows the influence, in terms of league places gained, of a reduced player injury rate in the Premier League, First, Second and Third Division, respectively.

![Graph showing the influence of injury reduction on playing performance.]

Figure 5.6. The influence of injury reduction on playing performance

Club-turnover

Figure 5.7 shows the influence, in terms of increased club-turnover, of a reduced player injury rate in the Premier League, First, Second and Third Division, respectively.
Figure 5.7. The influence of injury reduction on club-turnover

The average increase in club-turnover, as a function of magnitude of injury prevention and playing division, is shown in Figure 5.8.

Figure 5.8. Average increase in club-turnover (£M) as a function of Division and injury reduction rate
5.3.4. Cost benefit analysis

It was assumed that the salary for an injury prevention specialist would be scaled similarly to physiotherapists across the divisions, Table 5.6. The benefits were calculated from the sum of components of the direct and indirect costs. For direct costs, it was assumed that with injury reduction there would be savings in loss of benefit from salary and physiotherapy treatment costs. With indirect costs, it was assumed that the benefits would be the difference in club-turnover with players being available, rather than unavailable because of injury. Figure 5.9 shows the injury reduction levels required, per player, to cover the investment costs associated with an injury prevention specialist, as a function of playing division.

![Graph showing CBA level and injury reduction levels]

**Figure 5.9. Level of injury reduction to cover the investment costs of an injury prevention specialist as a function of playing Division**

The required percentage reductions in injury rates per player, per season, for the Premier League, First, Second, and Third Division, were 3.9% (1.5 days), 8.5% (3.3 days), 17.2% (6.7 days) and 25.4% (9.9 days), respectively. On average, the ratio of direct to indirect costs was 1: 0.15 for all Divisions (Premier – 1: 0.13, First Division – 1: 0.14, Second Division – 1: 0.18, Third Division – 1: 0.13).
PART B: Case study of a Premier League football club

5.3.5. Club demographics

Over the five seasons, fifty-four squad players played in at least one first team match. The fifty-four players were made up of three goalkeepers (GK), nineteen defenders (DF), sixteen midfielders (MF) and sixteen forwards (FW) who were involved in 49, 170, 147 and 110 of the total number of injuries, respectively. Each player was at the club during the analysis period for 24.3 ± 14.7 (4 – 60) months playing in 66.5 ± 52.2 (10 – 218) competitive reserve and / or first team matches.

A summary of the overall playing performance and successes during the five playing seasons is shown in Table 5.8. These performance parameters are also listed against the financial performance of the club.

Table 5.8. Overview of financial and playing performance for playing seasons 1993/94-1997/98

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>League position</td>
<td>10th</td>
<td>18th</td>
<td>4th</td>
<td>5th</td>
<td>7th</td>
</tr>
<tr>
<td>League Cup</td>
<td>Winners</td>
<td>4th round</td>
<td>Winners</td>
<td>4th round</td>
<td>3rd round</td>
</tr>
<tr>
<td>FA Cup</td>
<td>5th round</td>
<td>4th round</td>
<td>Semi-final</td>
<td>4th round</td>
<td>5th round</td>
</tr>
<tr>
<td>Europe</td>
<td>UEFA</td>
<td>UEFA</td>
<td>-</td>
<td>UEFA</td>
<td>UEFA</td>
</tr>
<tr>
<td>2nd round</td>
<td>2nd round</td>
<td>1st round</td>
<td>3rd round</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average attendance</td>
<td>28,962</td>
<td>29,756</td>
<td>32,613</td>
<td>36,027</td>
<td>36,136</td>
</tr>
<tr>
<td>Turnover (£000s)</td>
<td>13,014</td>
<td>13,001</td>
<td>18,865</td>
<td>22,079</td>
<td>31,769</td>
</tr>
<tr>
<td>Profit before transfers (£000s)</td>
<td>4,459</td>
<td>3,241</td>
<td>6,151</td>
<td>5,410</td>
<td>10,798</td>
</tr>
<tr>
<td>Profit after transfers (£000s)</td>
<td>2,138</td>
<td>3,668</td>
<td>50</td>
<td>3,926</td>
<td>11,740</td>
</tr>
</tbody>
</table>
5.3.6 Injury overview

All of the players who represented the first team received an injury during the first four playing seasons (1993/94: 25, 1994/95: 28, 1995/96: 24, 1996/97: 22) and 91% (20) of the players received an injury in the playing season 1997/98. On average, each player was responsible for $8.8 \pm 8.2$ injuries, of which $6.4 \pm 6.5$ occurred in competitive matches and $2.4 \pm 2.7$ occurred in training. Each player was absent from training and competitive match play for $100.6 \pm 109.3$ days, missing $59.2 \pm 36.8$ competitive First team matches through injury or non-selection.

During the playing seasons 1993/94, 1994/95, 1995/96, 1996/97 and 1997/98, 25, 28, 24, 22 and 22 different players appeared for the first team for at least one appearance. The average absence rate per player per season was $44.7$ days (1993/94: 60.5 days; 1994/95: 35.1 days; 1995/96: 57.5 days; 1996/97: 35.5 days; 1997/98: 35.1 days). Assuming players have 4-6 weeks close season rest period per year, then the average rate of absence, per player, as a proportion of their total training and playing time was 13% (1993/94: 18%; 1994/95: 10%; 1995/96: 17%; 1996/97: 11%; 1997/98: 11%).

Over the five seasons, 476 injuries were recorded that prevented a first team player training or playing for at least one day. These injuries accounted for 5430 days of absence and 540 matches where at least one player was not available for selection. The average duration of days of absence per injury was $11.4 \pm 25.6$ with each injury also leading to $1.4 \pm 3.8$ games where a player was unavailable for selection. The cumulative frequency and cumulative risk distributions for days of absence for new and re-injuries are shown in Figure 5.10.
There was a significant difference in the frequency of injuries that were reported in competitive matches (73.1%) compared to training (26.9%) ($\chi^2 = 101.7, p < 0.001$).

There were no significant differences in average durations of days of absence, per player, as a function of playing season (1993/94: 11.5 ± 20.5, 1994/95: 11.0 ± 30.3, 1995/96: 15.2 ± 40.5, 1996/97: 9.3 ± 13.4, 1997/98: 11.4 ± 25.6). Season 1993/94 accounted for a greater proportion of the total days absent (1513: 27.9%) compared to seasons 1994/95 (983: 18.1%), 1995/96 (1380: 25.4%), 1996/97 (781: 14.4%) and 1997/98 (773: 14.2%). There were also no significant differences in the average number of missed first team games across playing season (1993/94: 1.4 ± 3.5, 1994/95: 1.6 ± 4.6, 1995/96: 1.7 ± 4.7, 1996/97: 0.9 ± 1.9, 1997/98: 1.0 ± 1.6). The cumulative frequency and cumulative risk distributions for days of absence for all injuries as a function of season are shown in Figure 5.11 and Figure 5.12, respectively.
Of the 476 injuries, 27.5% (131), 18.7% (89), 19.1% (91), 17.6% (84) and 17.0% (81) of injuries were recorded in the playing seasons 1993/94, 1994/95, 1995/96, 1996/97 and 1997/98, respectively. There was a significantly greater number of injuries for playing season 1993/94 ($\chi^2_4 = 17.5, p < 0.01$).
Injury severity

Major injuries accounted for a greater proportion of days of absence (2622: 48.3%) compared to moderate (1934: 35.6%), minor (485: 8.9%) and slight (389: 7.2%) injuries. The average number of days of absence for slight, minor, moderate and major injuries was $1.8 \pm 0.9$, $5.2 \pm 1.1$, $15.0 \pm 6.9$ and $72.8 \pm 64.1$, respectively ($F_{3, 472} = 168.8, p < 0.001$). Of the 476 injuries there was a significant difference between the proportion of slight (45.6%), minor (19.7%), moderate (27.1%) and major injuries (7.6%), respectively ($\chi^2_{3} = 144.7, p < 0.001$). There were no significant differences in the distribution of slight, minor, moderate and major injuries as a function of season, Figure 5.13.

![Figure 5.13. The distribution of injuries as a function of playing season and injury severity](image)

Playing season 1995/96 accounted for the greatest proportion of slight (48.4%) and major (8.8%) injuries, playing season 1994/95 for the greatest proportion of minor injuries (30.3%) and season 1993/94 for the greatest proportion of moderate injuries (31.3%).

Re-injuries

Of the total injuries recorded over the five playing seasons, 12.6% (60) were due to re-injury of a previous condition. There were no significant differences in the average numbers of days of absence for a re-injury ($13.5 \pm 16.1$) or a new injury ($11.1 \pm 26.7$) but re-injuries accounted
for 14.9% of the total days of absence. There were no significant differences in the proportions of re-injuries as a function of playing season (1993/94: 17.6%, 1994/95: 11.3%, 1995/96: 7.7%, 1996/97: 13.1%, and 1997/98: 12.3%).

5.3.7. Direct costs

The insurance premium costs for career ending injury cover over the five playing seasons are shown in Table 5.9. Allowing for the allocated discounts there was an approximate annual increase of 13.5% in insurance premiums each year. The premium costs for private medical insurance cover are also shown in Table 5.9. There was an approximate annual increase of 8% in private medical insurance premiums from playing season 1993/94 to playing season 1997/98.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total career ending premiums / yr. (£000s)</td>
<td>300</td>
<td>341</td>
<td>387</td>
<td>439</td>
<td>498</td>
</tr>
<tr>
<td>Total career ending premiums / yr. / player (£)</td>
<td>7500</td>
<td>8525</td>
<td>9675</td>
<td>10975</td>
<td>12450</td>
</tr>
<tr>
<td>Private medical premiums / yr. (£000s)</td>
<td>50</td>
<td>54</td>
<td>59</td>
<td>64</td>
<td>69</td>
</tr>
<tr>
<td>Private medical premiums / yr. / player (£)</td>
<td>1250</td>
<td>1350</td>
<td>1475</td>
<td>1600</td>
<td>1725</td>
</tr>
</tbody>
</table>

Physiotherapy costs during injury treatment and rehabilitation

The contribution of the physiotherapist to the injury costs was based on the time spent during injury treatment and rehabilitation. The club had one full-time physiotherapist during this period dealing with the professionals for four of the playing seasons being analysed (1993/94, 1994/95, 1995/96, and 1996/97) and two full-time physiotherapists for the remaining season (1997/98). There were additional part time physiotherapists available at the club but these
Chapter 5: Cost benefit analysis of injury prevention strategies

dealt with the youth sides or covered treatment and rehabilitation when the senior physiotherapist was working away from the training ground.

On average, the senior physiotherapist indicated that he worked, on average, 80 hours per week. Fifty percent of this time was spent on treatment and rehabilitation, 6% on injury prevention work and the remainder (44%) on other tasks such as administration, meetings, travel and completion of medical records. This did not vary throughout the five playing seasons.

To calculate the contribution costs of the physiotherapist to the injury treatment and rehabilitation process, details on the absence period per injury, the average numbers of players injured per season and the number of injuries per week were used, Table 5.10. The numbers of new injuries per week were equated, over the study period, to a 48-week playing season. The treatment schedule for the physiotherapist was based on the assumption that the time spent dealing with minor injury complaints for 'non-injured players' would not influence the overall treatment time.

Table 5.10. Typical days of absence and the number of new injuries per week used to calculate the physiotherapist's treatment schedule

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average no. of players</td>
<td>25</td>
<td>28</td>
<td>24</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Mean days of absence</td>
<td>12</td>
<td>11</td>
<td>15</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>% players injured / season</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>Average no. new injuries / wk.</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Based on these calculations, the physiotherapist treated, on average, six players per day for season 1993/94 and four players per day for playing seasons 1994/95, 1995/96, 1996/97 and 1997/98. Hence, the average time spent per injured player per day was calculated, Table 5.11.
Table 5.11. Average physiotherapist’s time spent on injury treatment and rehabilitation per injured player

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time available / day for treatment (hrs)</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
</tr>
<tr>
<td>No. players requiring treatment</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Time per injured player / day (hrs)</td>
<td>1.0</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
</tr>
</tbody>
</table>

To cost the services of physiotherapy support within the club, the product of the physiotherapy hourly rate and total time spent per injury was used. The hourly rates of pay equated to approximately £10, £10.50, £11, £11.50 and £12 per hour for the playing seasons 1993/94, 1994/95, 1995/96, 1996/97, 1997/98, respectively. These rates were based on a typical 80-hour working week. The change in salary was the equivalent of an average 4.65% annual increase over the analysis period. The cost of the time spent on injury treatment and rehabilitation was estimated from the product of the total number of days of absence, the time spent per injury per player and the hourly cost of the physiotherapy service, Figure 5.14.
Chapter 5: Cost benefit analysis of injury prevention strategies

Figure 5.14. Annual costs of physiotherapy treatment and rehabilitation time as a function of playing season

Salary costs

The financial and annual reports from the case study club did not include specific details on players’ salaries owing to the sensitive nature of this information. Hence, salary data obtained from the Football League Ltd (1998, personal communication) were used for loss of salary benefit, Figure 5.4. Increases in salary over the analysis period were calculated from rates provided by Boon et al (1999).

Other costs

Of the other costs incurred within the club, consumables e.g. tape, bandages, were considered to be minimal relative to the total injury costs and these were therefore not included in the calculations. In addition to the private medical cover and insurance costs, the club employs a doctor at an annual fee of £10,000. This equates to £416 per professional player, per year, who represented the first team.

A value for equipment costs and depreciation was integrated within the analysis. The physiotherapy modalities available at the club were priced at £9000. This equipment cost procedure was based on the available equipment listed by the physiotherapist in the survey response that formed part of Chapter 4. For the first two playing seasons, the club did not
have any significant injury rehabilitation equipment in terms of cardiovascular and resistance equipment. In 1995/96, the club obtained equipment to the value of £120,000. This cost and the cost of physiotherapy modalities was depreciated over a five-year period to obtain equipment costs for the analysis period per year.

**Cost summary**

A summary of the direct injury costs across each playing season is shown in Figure 5.15.

![Figure 5.15. Summary of direct costs due to injury as a function of playing season](image)

5.3.8. **Indirect costs**

The average final league position during the five playing seasons was 8.8 (1993/94: 10th, 1994/95: 18th, 1995/96: 4th, 1996/97: 5th, 1997/98: 7th). From Figures 5.6 and 5.7, the influence of various injury prevention levels on team-performance and club-turnover in the Premier League, respectively, were obtained for the case study club, Figure 5.16.
5.3.9. Cost benefit analysis

To assess the level of benefit that would be required for investment in an injury prevention specialist, a salary similar to the senior physiotherapist was used as the investment cost. This equated to a salary of £41,600, £43,680, £45,760, £47,840 and £49,920 for the playing seasons 1993/94, 1994/95, 1995/96, 1996/97 and 1997/98, respectively. It is assumed that the injury prevention specialist would only have an influence on the direct costs that are dependent on the injury frequency. The career ending insurance premiums and the private medical insurance premiums have steadily increased over the five-year period.

Figure 5.17 shows the injury reduction levels, per player, which need to be reduced to cover the investment costs of an injury prevention specialist. The required reduction in injury rate, on average, equated to a reduction in current injury levels per player, per season of 4.8% (2.1 days). The ratio of direct to indirect costs for the analysis period was 1: 0.26.
Chapter 5: Cost benefit analysis of injury prevention strategies

Figure 5.17. Level of injury reduction to cover the investment costs of an injury prevention specialist (all seasons)
5.4 DISCUSSION

The aim of the present chapter was to establish the direct costs of injury to professional football clubs for the playing season 1997/98. An additional part of the study assessed the costs of investing in an injury prevention specialist, in which the majority of clubs were deficient, Chapter 4. The levels of injury reduction required to justify the investment of the specialist were also calculated. This process was also applied in a case study over a five year period for a Premier League football club, using injury reports and costs specific to the case study. This process forms an integral element of the risk management process that was initiated through the work of Hawkins (1997) as part of the risk estimation procedure. The process was continued through Chapters 2, 3 and 4 of this thesis as part of the risk evaluation.

The direct costs relate to the costs of health care and other immediate losses, e.g. salaries, whilst the indirect costs relates to those costs of loss in production (van Beeck et al., 1997). In relation to professional football clubs, the indirect consequences of injury within professional football clubs relate to the performance during competition, which in turn influences such factors as league position, match attendance, merchandising etc. Epidemiological studies from the United Kingdom were used to provide consistency in data comparisons as data tend to differ from European and South American studies (Larson et al., 1996; Hawkins, 1997).

Part A: General Application

5.4.1 Direct Costs

The present study has shown that the typical incidence and risk of injury during the season 1997/98 cost an ‘average’ Premier League football club £0.71M. This figure was £0.22M per year, per club, for the First Division, £0.10M for the Second Division and £0.06M for the Third Division. Hence, the total direct cost of player injury to the English football industry for the playing season 1997/98 was £23.1M (Premier League: £14.0M, First Division: £5.3M, Second Division: £2.4M, Third Division: £1.4M).

The majority of the direct losses for the football clubs are due to loss of benefit through player salary and the cost of players’ career ending insurance cover. As players’ salaries are disproportionately greater for the Premier League, the loss of benefit of player skill, measured as player salary and expressed as a percentage of total losses, is much greater for the Premier
league compared to all other divisions (Premier: 81.3%, First Division: 74.2%, Second Division: 66.3%, Third Division: 61.0%) (Boon et al, 1999). With career ending insurance premiums based on player salary and expressed as a percentage, these costs were also greatest for the Premier league (Premier: 7.9%, First Division: 7.3%, Second Division: 6.5%, Third Division: 6.1%). In contrast, the relative costs of physiotherapy treatment (Premier: 10.0%, First Division: 16.8%, Second Division: 23.6%, Third Division: 27.8%) and private medical insurance which are independent of players' salaries were greater for Third and Second Division clubs respectively (Premier: 0.8%, First Division: 2.1%, Second Division: 3.6%, Third Division: 5.1%). The costs incurred by the club through player injury that specifically relate to the players' health and safety, i.e. physiotherapy support and private medical care, contribute the smallest proportion of the direct costs.

The total fixed cost investment per season, to provide injury treatment, rehabilitation and prevention resources (physiotherapy support, private medical insurance and equipment) for players, was just 2.0% of turnover in the Premier League. The investment in player injury support for the average First (3.4%), Second (5.6%) and Third division (9.3%) club, in terms of proportion of turnover was progressively larger, but still represented a relatively small proportion of total turnover. In absolute terms, the fixed injury support cost investment, per player, per division, was approximately two to three times greater for the Premier league compared to the Football League clubs (Premier: £14100, Division 1: £7709, Division 2: £5930, Division 3: £4795). This is despite the fact that the average turnover for the Premier League was four times greater than the First division, ten times greater than the Second Division and twenty-five times greater than the Third Division (Boon et al, 1999).

In the present study, the loss of benefit from salary, Figure 5.4, and physiotherapy treatment costs, Figure 5.3, were proportioned according to injury severity. Based on this classification system, the major injuries accounted for the largest proportion of physiotherapy and salary costs in all divisions. This is despite the fact that major injuries account for the smallest frequency of all injuries (slight: 16.5%, minor: 34.8%, moderate: 37.0%, major: 11.7%), Chapter 3. For clubs to gain maximum cost benefit from their investment in players' health and safety support services, it would seem appropriate to reduce the frequency and severity of the major injuries, which result in extended periods of absence. One major source of costs is related to the risks associated with re-injuries, Chapter 3.
5.4.2. Indirect costs

Within professional football, the indirect financial consequences of player injury are accounted for by the losses in the financial returns from spectators, e.g. attendance and merchandising; broadcasting money; income from cup runs and final league position. It has been estimated that following promotion to the Premier League in 2000, Charlton Athletic would receive indirect income of approximately £8M for the season 2000/01 (Ward and Colchester, 2000). For those clubs that are relegated and fail to return to the Premier League, whilst maintaining a Premier League management and player structure, the indirect financial consequences are also substantial. Manchester City’s fall from the Premier League in 1996 led to an operating loss that wiped out almost the total operating profits of the two previous years’. For Wolverhampton Wanderers, five consecutive years of heavy financial losses in pursuit of Premier League status led to pre-tax losses of over £6M (Barton et al, 1998). In stark contrast, for those clubs that have achieved promotion from Division One and maintained their status in the Premier League, the turnover increases have been substantial (138 %: Derby County, 87 %: Sunderland, 83 %: Leicester City (Boon et al, 1999)).

In the present study, analyses of the indirect losses attributed to players’ injuries were assessed through application of the risk framework model developed in Chapter 2. The influence of a reduced player absence rate on team-performance, Figure 5.7, showed that injury reduction had the greatest influence on playing performance for clubs in the First and Second Division. Further reductions in injury levels led to further improvements in team-performance. This was partly expected, as Figure 5.7 represents the reverse effect shown in Figure 3.20, which showed the influence of player injury on team-performance. However, Figure 5.7 was based on actual injury absence rates as opposed to theoretical values. The influence of injury reduction on team-performance tends to be much less for the top half of the Premier League, whose clubs have a large high-quality playing squad, and the bottom half of Third Division clubs, where clubs have relatively small playing squads. A maximum of two league positions could be gained by reducing injury levels by fifty-percent. This would indicate that for these clubs to produce a further increase in team-performance, team-quality has a major influence on the relative performance of the football club. Consequently, these clubs must invest in new playing staff to produce significant increases in performance.
The influence of a reduced player absence rate on club-turnover, Figure 5.8, showed that Premier League clubs could obtain the greatest increases in club-turnover achieved through injury reduction. This was despite the relatively small improvements in league position achieved with reduced injury rates. The indirect financial rewards were most significant for those Premier League clubs that had finished just outside European competition qualification places. However, on average, Figure 5.9, the indirect financial rewards associated with a 10% reduced player-injury rate were sufficient to cover the investment costs of an injury prevention specialist for Premier League, Division 1 and Division 2 clubs. The reduction in player absence rate was slightly higher for Division 3 clubs.

Despite the significant increases in team-performance for the First and Second Division clubs, the relative rewards in terms of club-turnover were not comparable to the Premier League. However, the future potential increase in club-turnover for Division 1 clubs whose increase in playing performance could lead to promotion to the Premier League was substantial. Peter Varney, chief executive, after they gained promotion to the Premier League, for the 2000 / 2001 playing season described the increase in turnover for Charlton Athletic. The increase in television income was estimated to be £800,000 in the First Division to £8M in the Premier League, and a potential £18M - £20M the following season (Ward and Colchester, 2000). The vast increase in television income from consecutive seasons in the Premier League is a result of the new television contracts sold to broadcasting companies.

The Health and Safety Executive (1993) has shown that the ratio of direct to indirect costs for accidents in British industry was between 1:8 and 1:36. However, in the present study, the direct costs associated with player injury were greater than the indirect costs (1:0.15). This is because player salaries, which account for a significant proportion of club-turnover (Boon et al, 1999) also account for the majority of direct costs. The ratio of direct to indirect costs varies for each club depending on the player injury rate, team-quality and current league position. Any reduction in injury rate will vastly reduce the direct costs because of the savings through player salary. There will also be a decrease in potential loss of club-turnover as the club increases its team-performance with reduced player absence.

5.4.3 Cost benefit analysis

One of the major aims of the present study was to evaluate the benefits to a professional football club of investing in injury prevention through the employment of a sports science
specialist. In order to accurately calculate the benefits of investing in additional support services, it is important to know what effect a proposed intervention is going to have on the injury rate, and hence the averted losses (Tolpin and Bentkover, 1981). Within sports science, limited prospective work has addressed the issue of injury prevention strategies on injury incidence. This is primarily because sports injury is a multi-factorial problem resulting from undefined interactions between physiological, psychological, environmental and random factors (Gleim and McHugh, 1997). To overcome this, a calculation for the level of injury reduction necessary to equal or exceed the cost of investing in specialist support was adopted.

Based on the sum of the indirect and direct injury costs, the present study has shown that to achieve a cost benefit level, Premier clubs need to reduce the period of absence per player per season by 3.9% (1.5 days). This figure increases to 8.5% (3.3 days), 17.2% (6.7 days) and 25.4% (9.9 days) for Division 1, 2 and 3 clubs, respectively. The total days of absence that need to be reduced to justify investment in injury prevention services is equivalent to 60, 106, 174 and 218 days for Premier, Division 1, 2 and 3 clubs, respectively.

By preventing the less frequent major injuries (11.6% of all injuries, Chapter 3) a club could also achieve the cost benefit level in terms of the total squad absence. Based on the injury risk data from Chapter 3, it can be assumed that for a typical Premier League club, with 40 squad players, there would be 72 injuries per season resulting in 1404 days of absence. Of these injuries, only 8.4 injuries would be classified as major but they would account for 665 days absence or 79.2 days absence per major injury. Only 0.9 (10.7%) major injuries would need to be avoided to cover the investment costs of the proposed intervention. For First (32 players), Second (26 players), and Third (22 players) division clubs, injury reduction rates of 1.4 (20.9%), 2.7 (50.0%), and 3.1 (67.5%) in major injuries would need to be achieved to cover the benefit costs. The reduction in all re-injuries (27.0% of all days absent, Chapter 3) could also account for the savings required for investment in an injury prevention specialist for all divisions. This can be achieved by ensuring players are fully fit to return to play when returning from injury by benchmarking players’ physical and physiological capacities (Fuller and Hawkins, 1997).

In risk management, the terms ‘so far as is reasonably practicable’, ‘best practicable means’, and ‘not entailing excessive costs’ are often used to assess whether investment in a project is beneficial. The present study has illustrated that to justify investment in injury prevention provision, the total reduction in injury rate can be considered achievable for all clubs.
However, the financial investment is harder to justify for Second and Third Division clubs where the reduction in days of absence is over a fifth of their current absence rate. In addition, the financial turnover and financial losses of lower league clubs (Boon et al, 1999) will stipulate that alternative measures are sought to reduce injury rates. Fuller (1998) has described how health and safety investment in industry is based on economic considerations. Where it becomes 'impracticable' for lower division clubs to invest in injury prevention services, there are more cost efficient ways in which a reduction in injury rate can be achieved. These methods may include part-time employment, increased training for existing staff on prevention strategies, or the use of lower salaries. By adopting such methods however, clubs have to be aware that they could be investing in poorer quality and less experienced staff, who may not achieve the rates of injury reduction required to justify the smaller benefit costs.

Part B: Case study of a Premier League football club

5.4.4. Injury epidemiology

Injury Overview

The average number of days of absence per injury reported within the case study club was 22% less than the average reported within Chapter 3 (11.4 ± 25.6 vs. 14.6 ± 22.5). This mean absence period was also reflected in the distribution of injuries as a function of injury severity, where the proportions of major, moderate and minor injuries were all slightly less in the case study when compared to the 'average' club described in Chapter 3 (major: 7.6% vs. 11.6%, moderate: 27.1% vs. 37.1%, minor: 19.7% vs. 34.4%, slight: 45.6% vs. 16.9%). There could be a variety of reasons for these differences between the case study club and the average club. This might include better provision of injury treatment and rehabilitation services and facilities, better training and injury prevention strategies provided by the management, coaching and medical staff, or greater injury prevention knowledge and perceptions of the risk of injury by the players. Inklaar (1994b) has suggested that absence from play categorised by injury severity is likely to be influenced by access to, availability of, and quality of medial care and rehabilitation.

In addition to the mean absence period from training and competition, each player was unavailable for selection for 1.4 ± 3.8 competitive matches. This figure appears very low
compared to the injury rate but it was evident from the records that many players did not train during the week yet played in competitive matches at the weekend. The training absence would therefore be recorded as absence from work. There were also instances during the period of rehabilitation, where players returned to full training and this session would therefore not be classified as a day of absence. In these instances, the players and the clubs are placing themselves at increased risk because of the potential for re-injury. In a prospective study of Swedish professional footballers, 20% of minor injuries were followed by a moderate or major injury within two months of the original incident (Ekstrand and Gillquist, 1983).

**Injury severity and absence**

When the injuries were classified according to injury severity, major injuries accounted for the smallest frequency of reportable injuries but represented nearly one half of all days of absence. This pattern was similar to that reported for the 'average club' in Chapter 3. Therefore, major injuries represented the greatest risk to the club despite their low frequency of occurrence.

A more accurate analysis of injury frequency and injury risk was used in Chapter 3 to illustrate the midpoint for both injury frequency and injury risk. Within the present study, it was shown that the 50% cumulative frequency midpoint of all new injuries led to periods of absence of four days or less but represented 10% of the risk to the club. In contrast, 50% of the cumulative risk to the club of all new injuries led to periods of absence of 32 days or less and represented 93% of all the reported new injuries. Therefore, a small proportion of all injuries (7%), which led to periods of absence greater than 32 days, represented 50% of the injury risk to the club. Thirteen percent of re-injuries, which led to absence periods greater than 30 days, accounted for 50% of the risk to the club. The 50% cumulative frequency midpoint of re-injuries represented periods of absence of ten days or less and only 20% of the injury risk to the club. The use of benchmarking procedures (Fuller and Hawkins, 1997) to prevent re-injury is one method of reducing the risks associated with re-injury.

**First team squad absence**

On average, the first team players were absent for 1086 days per playing season analysed. This equated to 45 days of absence per first team player and a total absence rate of 13% of
total working time for each player. This absence rate is identical to the calculation for the average club defined within Chapter 3 and is therefore fifty times greater than the average absence periods for British industry employees calculated in Chapter 3 (Davies and Teasdale, 1994; Health and Safety Commission, 1998).

Inter-season comparison

The playing seasons 1993/94 and 1995/96 accounted for the greatest relative proportions of days lost through injury. Playing season 1993/94 also had a substantially greater absolute number of injuries compared to all other playing seasons. The high number of days of absence in playing season 1995/96 was due to the greater proportion of major injuries compared to playing seasons 1994/95, 1996/97, and 1997/98. When comparing the injury risk data for each season, there were similarities in the 50% cumulative frequency midpoint across all playing seasons. The 50% cumulative frequency value led to periods of absence of 6 days or less, which correspond to between 7% and 19% of the risk to the club (1993/94: 9%, 1994/95: 19%, 1995/96: 7%, 1996/97: 12%, and 1997/98: 12%). In contrast, the 50% cumulative risk midpoint varied across playing season (1993/94: < 28 days, 1994/95: < 56 days, 1995/96: < 76 days, 1996/97: < 24 days, 1997/98: < 20 days). In general, the 50% cumulative risk midpoints accounted for 88% - 97% of all injuries (1993/94: 92%, 1994/95: 97%, 1995/96: 96%, 1996/97: 90%, and 1997/98: 88%).

Despite the greater number of injuries and days of absence in playing season 1995/96, the club had its greatest success during this season. The club finished 4th in the Premier League, won the League Cup and reached the semi-final in the F.A. Cup. This was also the season when a relatively small number of injuries (4%) accounted for 50% of the risk. Therefore, the high number of days lost was due to a relatively small number of long-term injuries. In the season 1995/96, the club also invested heavily in new players, which is reflected in its lowest profit level, after transfers, during the analysis period. It is likely that the increased playing staff accounted for the success during this season.

5.4.5. Financial consequences of player injury

Direct costs
Using the injury specific and cost specific characteristics of the case study, a detailed analysis was produced to illustrate the financial impact that injury has had on the case study football club. The total direct cost of injury over the analysis period for the first team playing squad was £3.0M. The greatest injury costs were recorded for playing season 1997/98 (1993/94: £0.53M, 1994/95: £0.44M, 1995/96: £0.69M, 1996/97: £0.58M, 1997/98: £0.79M).

The direct costs for the case study club for season 1997/98 were similar to the typical values calculated for the average Premier League club reported earlier (case study: £0.79m vs. average club: £0.71m). This is despite the fact that the costs for the case study only reflect the first team players (approximately 24) whereas the average costs are calculated for a squad of 40 players. The greater costs are due to the higher days of absence for the case study compared to Chapter 3.

**Indirect costs**

The risk framework model, which is described in Chapter 2, was used to estimate the potential loss in indirect income due to player injury, Figure 5.18, over the five-year analysis period. The potential increases in team-performance, due to a reduction in player absence, were minimal. An increase in club-turnover only comes about with an increase in league position. For this to be achieved, Figure 5.17 shows that the injury reduction rate, per player, should exceed 40% per player. The increase in club-turnover in response to this increase in team-performance far exceeds the investment costs attributed to an injury prevention specialist. In some instances, the improvement in league position of only one position would lead to qualification for European competition, where the financial rewards exceed the earnings potential for the whole domestic football season.

The ratio of direct to indirect costs in the case study club (1: 0.26) was twice that of the average Premier League club. This was because fewer players were used in the analysis of the case study compared to the average Premier League club (24 vs.40). This ratio indirectly indicates that player injury in the case study has a greater influence on club-turnover and consequently team-performance compared to the average Premier league club.

**Cost benefit analysis**
The case study club did not employ a sports science specialist over the study period to provide injury prevention services to the players. Therefore, a cost benefit analysis was used to evaluate the levels of injury reduction required to cover the costs associated with the investment, Figure 5.19. The analysis showed that, on average, each first-team player would need to have his absence period reduced by 2.1 days (4.8%) per season. The direct costs associated with player injury account for the majority of this cost-benefit balance. This injury reduction level is slightly greater than the average Premier League football club (1.7 days: 4.3%), Table 5.8, but this is due to the greater number of players used within the calculations for the average club. In general, this injury reduction level could be achieved by eliminating a single ‘slight’ injury per player, or elimination of a single major injury per squad, which would account for the total injury reduction level (50 days). A decrease of four re-injuries would also account for the investment costs associated with a sports science specialist.

Within risk management, investment decisions are made based on ‘not entailing excessive costs’. In consideration of the case study, investment in an injury prevention specialist would not entail excessive costs. The injury reduction rates are potentially achievable through implementation of prevention techniques discussed within Chapter 3, many of which are not used within the training environment of the case study club (Case study physiotherapist, 1998, personal communication). It is also possible that with continual education provided to the players within the club, players’ perceptions of the risks of injury would become more sensitive and lead to a reduction of injury within the competitive environment.
5.5 CONCLUSIONS

Cost benefit analysis is an evaluation tool used in risk management to appraise the return on investment expenditure (Warner and Luce, 1982; Sloan, 1996; Mishan, 1988). Costs versus benefits are fundamental to modern legislation and business management helping to target limited resources effectively. However, it should not be the sole tool used to justify investment into a 'risk management' programme as it can place too much emphasis on the results of arbitrary values (Sloan, 1996; Mishan, 1988). The present study has sought to overcome this issue by using industry-published data, and by liaising with appropriate authorities to obtain accurate financial information at a single point in time for the season 1997/98.

The use of risk management, of which cost benefit analysis is a component, is a novel way of assessing injury risk within professional football. The use of these established industry procedures is becoming increasingly relevant to the football industry with its continued financial growth. A third of all clubs are now floated on the share markets and the football industry is likely to increase turnover to one billion pounds over the next few seasons (Boon et al, 1999). Furthermore, the relatively high injury rates in professional football (Hawkins and Fuller, 1999) can potentially have an impact on the playing and financial performance of the club, Chapter 2.

To reduce the impact of player injury on the financial and playing performance to the club the injury risk needs to be minimised. The introduction of injury prevention strategies can eliminate or reduce the severity of many injuries, reducing the cost impact associated with player absence. There is evidence to demonstrate that introduction of injury prevention strategies can reduce the injury rate. Proprioceptive work can lead to a reduced incidence of both ankle ligament injuries (Tropp et al, 1985) and knee anterior cruciate ligament injuries (Caraffa et al, 1996). Warming up aids injury prevention and improves athletic performance of athletes (Gleim and McHugh, 1997). Inappropriate rehabilitation after injury is also responsible for many injuries (Ekstrand and Gillquist, 1982) and therefore a programme of progressive flexibility, strength and proprioceptive work may reduce the number of re-injuries.

The delivery of injury prevention strategies within professional football clubs is however, restricted for two major reasons. Although physiotherapists have the knowledge and expertise
to deliver such strategies, they do not have time within their existing job role to establish an effective prevention programme for the players. It is also unlikely that the existing coaching staff have the detailed knowledge to help within this programme, as discussed in Chapter 4. To overcome this problem, it is important for the clubs to invest in additional qualified personnel to establish such a programme and reduce the injury risk to the club. An injury prevention specialist should have multi-disciplinary knowledge of sports science applications, and be able to educate and provide services related to sports nutrition, psychology, physiological and physical fitness, health surveillance and some aspects of biomechanical analysis e.g. isokinetic principles. To justify the investment in a specialist, a cost benefit analysis can provide clubs with the necessary information to aid in the decision-making process.

The present study has shown that the levels of injury reduction required to justify investment in an injury prevention specialist are achievable targets and reasonably practicable for all professional football clubs. Justifying the investment costs is however more difficult for Second and Third Division clubs. By investing in an injury prevention specialist the clubs are fulfilling their health and safety obligations as assessed through the MHSW Regulations (1992) and releasing time for other medical staff to provide a greater level of care to injured players.

Clubs should recognise that the costs of investing in injury prevention support services will produce long-term benefits beyond those provided in the short-term by the purchase of additional players. The long-term benefits of investing in support for the playing staff is currently being demonstrated by those clubs investing in the development of youth players via the football academy system (Wilkinson, 1997). However, some clubs still try to buy success through player transfers despite a failure to recognise the contribution of other economic factors to a successful football club. This is witnessed in the huge investment by First Division clubs, who try to buy their way into the financial riches of the Premier League (Boon et al, 1999).

In studies of other British industries, the direct costs were minor compared to the contribution of the indirect costs from accidents and injury (Health and Safety Executive, 1993). In the present study however, the direct costs attributed to player injury far exceeded the indirect costs associated with player absence. The prime reason for this was the contribution of player salaries, which account for a major proportion of club-turnover (Boon et al, 1999) to the
direct costs. Furthermore, the indirect analysis has shown that for clubs finishing in the top half of the Premier League, the importance of a large, high quality playing squad is increasingly important to achieve playing and financial success.

A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident (Yin, 1994). In the present study, the use of the case study has illustrated the application of the risk management process within a Premier League football club. In the case study, the injury absence rates were similar to the ‘average’ club but the direct costs were slightly higher, which resulted in a higher cost-benefit balance for the investment in an injury prevention specialist. The use of this process illustrates the need for each club to assess its own health and safety performance in the context of its playing and financial performance.
5.6 STRENGTHS AND WEAKNESSES

Cost analysis of injuries within sport is a relatively under-researched area. The majority of published work has focused on population-based studies, and has illustrated the economic costs of sporting injury to society. In the early 1980’s some more specific analysis of sport injury by Tolpin and Bentkover (1981) led to recommendations being made concerning any future costing work. One of the major deficiencies was the absence of adequate data, in terms of injury extent, incidence, type, and severity. Fortunately, in the past ten years, these data have become readily available from English professional football through prospective work carried out by Hawkins and Fuller (1999), in addition to smaller studies by Lewin (1989) and McGregor and Rae (1996). These studies provided the reliable and consistent injury data, in UK professional football, required to process an applied cost benefit analysis. The cost analysis within the present study is therefore based on sound detailed research, enabling an accurate cost analysis for the average club to be established.

In addition to this information, much of the costing used for insurance cover has been based on current industry standards, which provide the most up to date information in a competitive and constantly changing insurance environment. Liaisons with the Football League have enabled accurate financial information on professional footballers’ salaries to be included within the analysis. This enables all players to be considered in the financial analysis as opposed to the few elite players whose high salaries are irregularly reported within the media. The costs are therefore accurate representations of current industry standards and provide a comprehensive structure at a single point in time (season 1997/98). The use of the injury and costing procedures with a case study club provides an application of these principles and demonstrates the feasibility of using risk management within professional football to aid decision-making and to improve business practice.

With the football industry becoming a more professional business operation, the analysis is likely to provide more appeal to the financial directors and operators of professional football clubs. By identifying the relatively low costs from investing in additional specialist staff to reduce the injury rates, it is likely to have more appeal to those who control the budgets. The club’s management should have less trouble in persuading such financial directors in investing in staff to support the health and safety of the players.
The use of a case study in the present chapter was useful as the boundaries between phenomenon and context were not evident (Yin, 1994). It was also a useful strategy as 'how' and 'why' questions were being posed with the investigator having little control over the events (Yin, 1994).

Despite their strengths, the Deloitte & Touche financial reports are not wholly accurate, and the deficiencies in these data could influence the context of the cost analysis. The factors which influence the financial reports include:

i) Information provided by non-stock market listed clubs is limited by the disclosure of published accounts. This is evident in the split of income and commercial activities.

ii) There are instances over the past seasons of clubs falling into the hands of receivers, which prevents financial reports being made available.

iii) The accounting policies adopted by clubs vary significantly, e.g. differences in ground depreciation, player valuation accounting policies, and this will influence the reported profitability by clubs.

iv) At the time of publication of the Deloitte & Touche reports, some clubs had not filed their annual accounts. In these cases, Deloitte & Touche used the previous year's report to complete the survey.

One other potential weakness in the present study was the use of average results to calculate costs and benefits associated with the investment of an injury prevention specialist. There is likely to be a high variability within clubs and within leagues, as demonstrated in the injury epidemiology between clubs (Hawkins, 1997). Therefore, it is important for each club to assess the investment of any new staff member or equipment based on their own injury data. However, the main aim of this chapter was to illustrate the magnitude of costs and to provide clubs with an indication of the costs of injury to their financial performance. The chapter was also presented to provide the impetus for clubs to allocate appropriate resources to reduce the injury risk to their players and to fulfil their legal health and safety obligations.
6.1 INTRODUCTION

Previous chapters have illustrated the impact that player injury can have on the football club, as an employer, in terms of financial and playing performance. However, the players themselves, as employees, also face significant medical and financial consequences of injury. Association football is a high intensity, high impact sport which places highly stressful, repeated physical demands of sprinting, stopping, cutting and pivoting on the physical functioning of players (Ekstrand and Nigg, 1989; Buckwalter and Lane, 1997). Such demands subject the joints to a significant amount of torque and load leading to acute injury and possible early traumatic osteoarthritis (OA) (Chantraine, 1985). However, the acute injury consequences to players (Hawkins and Fuller, 1999) only lead to permanent total disability for approximately 2% of the registered English playing professionals (Windsor, 1997). Fuller and Hawkins (1997) have suggested that there are also significant proportions of former players who leave the profession due to chronic injury. There are a number of studies that have described the prevalence of OA in former footballers compared to control groups for the ankle joint (Solonen 1966; Adams 1979; Kujala et al, 1994), knee joint (Klunder et al, 1980; Muckle 1983; Chantraine 1985; Neyret et al, 1993; Kujala et al, 1994; Roos et al, 1994; Kujala et al, 1995) and hip joint (Solonen 1966; Klunder et al, 1980; Lindberg et al, 1993; Vingard et al, 1993; Kujala et al, 1994), Table 6.1.
Table 6.1. A summary of selected studies that have investigated the incidence of OA in amateur and professional footballers

<table>
<thead>
<tr>
<th>Authors</th>
<th>Methods</th>
<th>Key findings</th>
</tr>
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<tbody>
<tr>
<td>Solonen (1966)</td>
<td>Clinical and radiographic examination</td>
<td>Greater osteophytes in footballers compared to controls on tibia (75% vs. 20%), dorsal edge of tibial joint surface (30% vs. 20%), tip of fibular malleolus (31% vs. 2%), talonavicular joint (72% vs. 12%).</td>
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<td></td>
<td>Group of 60 footballers compared to 40 controls</td>
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</tr>
<tr>
<td>Chantraine (1985)</td>
<td>Clinical and radiographic examination</td>
<td>26% group had been operated on meniscectomies. Of this group only 29% symptomatic of OA.</td>
</tr>
<tr>
<td></td>
<td>Group of 60 footballers compared to 40 controls</td>
<td></td>
</tr>
<tr>
<td>Lindberg <em>et al</em> (1993)</td>
<td>Radiographic examination.</td>
<td>Coxarthrosis in 5.6% former footballers vs. 2.8% controls.</td>
</tr>
<tr>
<td></td>
<td>Looked at 286 former footballers in Malmo, Sweden (mean age 55) compared with age matched controls.</td>
<td>In elite players the prevalence of coxarthrosis was 14% vs. 4.2% age matched controls.</td>
</tr>
<tr>
<td>Roos <em>et al</em> (1994)</td>
<td>Clinical and radiographic examination</td>
<td>OA reported in 15.5% elite vs. 4.2% age matched non-elite.</td>
</tr>
<tr>
<td></td>
<td>Used 286 former players over 40 years of age – 71 elite and 215 non-elite (4th and 5th divisions).</td>
<td>Average age of OA diagnosis was 45 for elite vs. 49 controls.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased prevalence of gonarthrosis among elite players without diagnosed knee injuries indicated that the sport itself might lead to degenerative changes.</td>
</tr>
<tr>
<td>Kujala <em>et al</em> (1994)</td>
<td>Looked at previous 21 years of hospital admissions for OA of hip, knee and ankle of former elite athletes and controls.</td>
<td>Age adjusted risk ratios vs. controls were 1.73 (endurance sports, e.g. running), 1.9 (mixed sports, e.g. football), 2.17 (power sports, e.g. weight lifting)</td>
</tr>
</tbody>
</table>
The long-term medical consequences of playing professional football have significant ramifications for the professional football industry. Osteoarthritis of the knee and hip are diseases that have been considered by the Industrial Injuries Advisory Council (I.I.A.C, 1995) for inclusion under the Industrial Injuries Scheme in section 108 (2) of the Contributions and Benefits Act 1992. After surveying the available evidence for the knee the I.I.A.C identified that certain occupations did have a greater risk of injury to cartilage and ligaments. Professional football was not listed as one of these occupations. The studies that had addressed this issue however were small, poorly designed and did not permit any firm conclusions to be made (I.I.A.C, 1995). Osteoarthritis of the hip is also still under consideration for inclusion but until stronger, prospective studies are designed this is unlikely to be added to the injuries list.

In addition to the long-term medical problems associated with playing football, there are socio-economic consequences associated with OA in former professional footballers. In unpublished results of a study by Turner and Barlow (Hicks, 1998), of 284 former players, whom 49% had been diagnosed OA, 68% of the diagnosed players indicated that they had problems with walking. Furthermore, 61% had problems with self-care activities, e.g. washing, dressing, housework, leisure activities, and 89% reported they were in moderate and extreme pain. A further 16% indicated that their injuries had affected work opportunities leading to early retirement or changes in their working patterns (Hicks, 1998). Similar findings have been identified in former Australian rugby league professionals where nearly 30% of respondents to a questionnaire indicated that they had lost income due to injury (Meir et al, 1997). The presence of OA in individuals still actively competing also has an influence...
on playing ability. Footballers with the most marked changes in clinical and radiological OA often had poor agility in turning and jumping, which relegated them to a lower standard of football (Muckle, 1983).

Although there are a number of studies that have indicated the risk of OA tends to be higher in professional footballers, Table 6.1, there is a dearth of information that specifically relates to the English professional football industry. As acute injury patterns and physical activity patterns vary tremendously between and within countries, the potential for the onset of OA joint complaints may also vary. There is also the need to expand on the socio-economic consequences faced by former players due to their career in professional football. Therefore, the aims of the chapter were to assess the prevalence of OA in a sample of former English professional footballers and to identify any potential risk factors for this degenerative disease. The study was also established to investigate what influence, if any, professional football has had on the continual socio-economic circumstances of former players. The study was planned and executed in co-operation with the Professional Footballers’ Association (PFA), who provided access to their database of former players.
6.2 METHOD

The content of the survey was based on existing published knowledge and criteria for assessing the causes and presence of OA.

6.2.1. Implementation of the survey

The questionnaire / survey was piloted with five former professional players, one of whom was a Premier league football club physiotherapist, to ensure that all details were comprehensible and would provide the details required. The questionnaire / survey was reviewed by senior management at the PFA, to ensure the content was suitable to be passed under the association’s name. The questionnaire / survey was distributed to 500 former professional players currently registered on the PFA database. Included with the survey was a PFA headed covering letter of explanation signed by the current Chief Executive, Mr Gordon Taylor, and a pre-paid reply envelope.

6.2.2. Selection and categorisation of the survey

The survey consisted of three broad sections each divided into a number of sub-sections. The three main sections within the survey provided information on medical related information, personal details and former players’ opinions and perceptions (appendix 2). Figure 6.1 provides the framework of the survey.
Figure 6.1. The survey design used to investigate the long-term impact of playing professional football
Personal details

Personal details were related to the dates at which the following events occurred: birth, first official schoolboy game, first professional contract and retirement from professional football. These details were important to help construct the lifetime physical activity record within the medical category. Details were also recorded on the football clubs played for and the respective employment dates, the highest playing level achieved and the individual's major playing position.

In addition, respondents were asked to identify the single major reason for their retirement. Reasons for their retirement were provided based on the pilot study with former professionals. Sections were also provided for respondents to identify their career path since retirement from professional football and to identify those organisations, which provided a level of help, if required, for financial, medical, career or educational guidance. Respondents' occupations after retirement from playing professional football were categorised using the Social Trends method of classification (HMSO, 2000).

Medical history

Details on aspects of medical care and medical status were subdivided into past and present sub-categories. Within the past sub-category, there were further sub-divisions into; previous injury history whilst playing professional football, medical support provided to enable the player to participate in competitive matches and training, and the lifetime physical activity record.

Respondents were asked to identify the number of moderate and major joint injuries received in the lower limb joints (hips, knees and ankles) whilst playing professional football. The injury definitions of 'moderate' (absent from training / competition for 1 week to 1 month) and 'major' (absent from training / competition for more than 1 month) have previously been used in professional football for assessing the epidemiology of acute injuries (Hawkins and Fuller, 1999). Additional evidence on the extent of joint injury was obtained from a history of the players' surgery and whether OA had been medically diagnosed by a specialist physician in any of their respective lower limb joints and the age/s at which the diagnoses were confirmed. Respondents were also asked to indicate the type and frequency of medical help used to help them play or train despite being injured.
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Lifetime physical activity

The final section of medical history quantified the lifetime physical activity records of former players. The divisions used within this section have previously been used by Kujala et al (1994; 1995) and Raty et al (1997) as part of the process to identify the contribution of physical activity exposure to the incidence of OA. Within this section, players were asked to identify the typical number of days per week that they trained during three different stages of their lifetime; schoolboy football, professional football and retirement. Details were also obtained on the type of training that the players were involved in at each stage of their lifetime. Training was classified as either endurance (continuous running), power (weight training) or specific football activities (sprinting, 5-a-side, turning, and twisting).

Current medical condition

Within this section, there were two sub-categories related to joint function and joint pain. To obtain details on current joint function and pain, typical daily activities (sleeping, rising from bed, sitting, standing, walking up / down stairs, walking over 1km and squatting / bending forward) were assessed for intensity of pain within each joint. The intensity of pain scale (nil, minor, moderate, severe and very severe) used within the present study has previously been validated by Lequesne and Samson (1991). The selection of the daily activities used within the present study has previously been used by Kujala et al, (1994; 1995), Raty et al (1997) and Lequesne and Samson (1991).

Perceptions

Within this category there were three main sub-categories related to: the assessment of support services provided during and after a player’s professional football career, their perceptions on the influence that injury has had on their career, and a measurement of a player’s willingness to reduce injury.

Players were asked to indicate their level of satisfaction with the medical, sports science and welfare / education services provided to them by their former employers whilst they were playing professional football. In addition, former players were asked to identify the level of advice and contribution provided to them at the point of retirement by the ruling organisations, employers and peer groups within professional football. This level of advice and contribution was rated for the issues of: medical, financial, career, and educational advice.
In addition, players were asked to assess the influence and level of injury required to significantly impinge on team playing success. The players were also asked to express their opinion and perceptions on a list of statements which assessed the influence that injury has had or was likely to have on a professional footballer's career including future medical problems, earning potential and career after retirement.

The final part of this section measured former players' willingness to reduce the level of injury experienced during their professional playing career. This was measured by assessing the relative proportion of a respondent's salary that they would be prepared to give up to reduce their level of injury by fifty-percent. Respondents were also asked to identify the amount of extra salary they would have expected to receive if their level of injury doubled during their career. The basis of these questions was modelled on a national sample survey, which estimated an individual's valuation of safety (Phillips et al, 1989).

6.2.3 Statistical analysis

All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS v.9.0.) for Windows computer package. Statistical significance was accepted at the p<0.05 level, unless stated otherwise. Values are reported as mean (S.D).

A variety of statistical techniques were used to assess the results from each section of the audit programme because of the different types of data obtained. For all data classified as categorical, cross tabulation methods using exact Chi – square for one and two samples were used. To assess for statistical differences in time spent in various forms of training and stage of career, a factorial ANOVA model was used. This method provides a more sensitive or powerful statistical test of the effect of the independent factors (Bryman and Cramer, 1999). A Mann-Whitney U test was used to assess differences between OA and non-OA diagnosed respondents and their willingness to pay a proportion of their salary to reduce injury. A post-hoc Tukey test was used to identify specific differences for all parametric tests.

Diagnosed arthritis rates (DARs), which were standardised to an exposure rate for every 100,000 hours were calculated for each lower limb joint. The DARs were calculated from the first schoolboy match to the average age at which OA was diagnosed in each lower limb joint. Competition exposure time was estimated for the typical number of competition games played per season reported for youth players (Reilly and Howe 1996; Lewin, 1989; Hodson, 1994; Hawkins and Fuller, 1999) and first team players (Lewin, 1989; McGregor and Rae, 1996; Reilly and Howe, 1996; Hawkins and Fuller, 1999). The average exposure rates for
training were obtained from the figures provided by respondents. The DARs were obtained using the formulae below:

**Total diagnosed arthritis rates (DAR̄):**

\[
\text{DAR} = \left( \frac{\text{number of respondents diagnosed with OA in at least one joint}}{\text{total exposure time} \times \text{number of respondents}} \right) \times 100000 \text{ hrs}
\]

**Diagnosed OA frequency rates (DAR) for each joint (J):**

\[
\text{DAR}_J = \left( \frac{\text{number of respondents diagnosed with arthritis in specified joint (J)}}{\text{total exposure time} \times \text{number of respondents}} \right) \times 100000 \text{ hrs}
\]
6.3 RESULTS

6.3.1. Response rate

Five hundred questionnaires were distributed, in April 2000, to ex-professional footballers, who were listed on the PFA player database. One hundred and eighty five questionnaires were returned (37.0%), Figure 6.2. Of these replies, eleven were unsuitable for use.

![Figure 6.2. Cumulative questionnaire response rate](image)

6.3.2. Personal details

Football career

The average age of the respondents was 47.6 ± 12.7 years. The average ages at which the respondents played their first competitive schoolboy game, signed their first professional contract, and retired from playing professional were 10.4 ± 2.4 (4 – 16), 18.0 ± 2.3 (16 – 27), and 32.4 ± 5.3 years (17 – 42), respectively. Respondents played, on average, for 4.2 ± 2.0 professional clubs during their professional football career. Of the respondents, 70.7% (123) were right-foot dominant, 19.5% (34) were left-foot dominant and 9.8% (17) were ambidextrous. There were significant differences in the number of players as a function of the
highest level of playing achievement [International: 68 (36.9%), Premier / Old 1st: 69 (41.1%), 1st / Old 2nd: 18 (10.7%), 2nd / Old 3rd: 7 (4.2%), 3rd / Old 4th: 6 (3.6%)] ($\chi^2 = 105.3, p < 0.001$). There were significant differences ($p < 0.001$) in the proportion of respondents according to playing position [(GK: 10 (5.9%), DF: 50 (29.8%), MF: 55 (32.7%), FW: 53 (31.5%)]) ($\chi^2 = 34.3, p < 0.001$). There was no significant difference between the proportion of respondents according to playing position when compared to a standard 1:4:4:2 formation. Figure 6.3 shows the distribution of respondents according to major playing position and highest playing level achieved.

![Figure 6.3. Distribution of respondents as a function of major playing position and highest playing level achieved](image)

Figure 6.3. Distribution of respondents as a function of major playing position and highest playing level achieved

Retirement from professional football

There were no significant differences in the major reasons for professional footballers retiring from playing competitive football. Acute injury (33: 19.0%) and chronic injury (46: 26.4%) accounted for the greatest proportion of respondents, as a function of retirement reason. Many of those who indicated that a ‘new career opportunity’ led to their retirement, either moved into either coaching or management posts within professional football.
Figure 6.4. Major reasons for retiring from playing professional football

Figure 6.5 shows the location and nature of acute injuries causing respondents to retire from playing professional football. There was a significant difference in the proportion of injuries, as a function of acute injury nature ($\chi^2=22.5$, $p<0.001$) and acute injury location ($\chi^2=9.9$, $p<0.05$), which were accountable for player retirement. The knee accounted for the greatest proportion of acute injuries (15: 42.9%) followed by the ankle (7: 20.0%), lower back (5: 14.3%) and lower leg (4: 12.1%) as a factor for retirement. Damage to the ligament structures (10: 35.7%), damage to the bone through fractures and dislocations (9: 32.1%) and damage to the cartilage (5: 17.9%) accounted for the greatest proportion of acute injuries as a function of injury nature.
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There was a significant difference in the proportion of injuries as a function of chronic injury location \( (\chi^2 = 30.9, p < 0.001) \) but not for chronic injury nature. The knee (17: 45.9%), lower back (10: 27.0%) and hip (4: 10.8%) accounted for the greatest proportion of injuries responsible for respondents retiring due to chronic injury. Many of the respondents (35: 76.1%) in this category were unable to identify the exact nature of their chronic injury but the few respondents who could provide this information, identified damage to cartilage (4: 23.5%), bone (3: 17.6%) and tendon (3: 17.6%).

Occupations since retirement from playing professional football

In total, the respondents had been employed in 342 different occupations since retirement from playing professional football. On average, respondents had been employed in 2.1 ± 1.0 occupations lasting 7.0 ± 7.3 years per occupation, since retirement from professional football. Of these occupations, 293 (85.7%) were full time and 73 (14.3%) were part time. There was a significant difference in the proportion of respondents and their new chosen occupations after retiring from playing professional football \( (\chi^2 = 316.5, p < 0.001) \). A significant proportion of players remained in the professional football industry through coaching (associate professional / technical) (125: 36.5%) or management jobs (team managers / administrators) (64: 18.7%), Figure 6.6. Another significant proportion progressed into sales posts of various forms, whether as their own enterprise or for an employer (44:...
12.9%). Under the category ‘other occupations’ (47: 14.6%), after dinner speaking, driving instruction, taxiing and youth work predominated.

Figure 6.6. Major occupational categories for former professional footballers

Help after retirement

The proportion of respondents that received some form of help after retirement for medical problems, financial needs, career advice or educational needs is shown in Table 6.2. Of the respondents that did not receive help from the listed organisations, many of the issues were not applicable to their specific needs and were therefore classified together with ‘no help’ under the same category. The ‘other’ organisations that provided some form of help were primarily educational establishments where former players progressed into lecturing / educational occupations. The Professional Footballers’ Association provided significantly more help to former players than any other organisation for medical ($\chi^2 = 111.4, p < 0.001$), financial ($\chi^2 = 174.1, p < 0.001$), career ($\chi^2 = 179.7, p < 0.001$) and educational requirements ($\chi^2 = 220.3, p < 0.001$).
Table 6.2. Proportion of respondents that received help after retirement from professional football (n=174)

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Medical problems</th>
<th>Financial aid</th>
<th>Career advice</th>
<th>Educational needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football Association</td>
<td>4.6</td>
<td>6.9</td>
<td>10.3</td>
<td>12.0</td>
</tr>
<tr>
<td>P.F.A</td>
<td>33.7</td>
<td>49.1</td>
<td>40.6</td>
<td>45.7</td>
</tr>
<tr>
<td>Football / Premier League</td>
<td>2.3</td>
<td>9.1</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Former club / s</td>
<td>13.7</td>
<td>9.1</td>
<td>6.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Club (s) insurance</td>
<td>8.6</td>
<td>6.3</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Personal insurance</td>
<td>14.3</td>
<td>16.6</td>
<td>1.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Fellow players</td>
<td>17.1</td>
<td>8.6</td>
<td>26.3</td>
<td>13.7</td>
</tr>
<tr>
<td>Others</td>
<td>1.1</td>
<td>0.6</td>
<td>3.4</td>
<td>2.3</td>
</tr>
</tbody>
</table>

The level of contribution (slight, minor, moderate, major) for those respondents who sought advice from the listed organisations is shown in Figures 6.7 to 6.10 for medical help, financial aid, career advice and educational requirements, respectively. The ‘all other’ categories was made up of contributions from former clubs, personal and club insurance policies. The Chi-square test statistics, which tested the level of contribution for respondents from each organisation, for medical help, financial aid, career advice and educational requirements, are shown in Table 6.3.

Table 6.3. Chi-square statistics for each level of contribution for respondents from each organisation, for medical help, financial aid, career advice and educational requirements

<table>
<thead>
<tr>
<th>Slight</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical problems</td>
<td>$\chi^2 = 25.0, p &lt; 0.01$</td>
<td>$\chi^2 = 16.1, p &lt; 0.05$</td>
<td>$\chi^2 = 69.8, p &lt; 0.001$</td>
</tr>
<tr>
<td>Financial aid</td>
<td>NS</td>
<td>$\chi^2 = 20.9, p &lt; 0.01$</td>
<td>$\chi^2 = 29.7, p &lt; 0.001$</td>
</tr>
<tr>
<td>Career advice</td>
<td>$\chi^2 = 30.1, p &lt; 0.01$</td>
<td>$\chi^2 = 18.0, p &lt; 0.001$</td>
<td>$\chi^2 = 53.1, p &lt; 0.001$</td>
</tr>
<tr>
<td>Educational needs</td>
<td>$\chi^2 = 10.1, p &lt; 0.05$</td>
<td>$\chi^2 = 12.9, p &lt; 0.05$</td>
<td>$\chi^2 = 24.6, p &lt; 0.001$</td>
</tr>
</tbody>
</table>

The P.F.A. provided a major contribution to more respondents, than any other organisation, for medical (27: 54.0%), financial (38: 73.0%), career (28: 63.6%) and educational requirements (42: 72.4%) compared to all other organisations. Fellow professional footballers provided a greater total level of support for slight to moderate help with medical (slight - 13:
30.9%, minor - 5: 48.5%, moderate - 8: 30.7%), career (slight - 16: 48.5%, minor - 8: 25.8%, moderate - 9: 23.1%) and educational support (slight - 8: 30.7%, minor - 7: 31.8%, moderate - 5: 17.2%). Former clubs provided a greater total level of support for slight to moderate categories to former players with financial help (slight - 6: 16.7%, minor: 2: 7.1%, moderate - 6: 12.8%).

Figure 6.7. Level of contribution provided to respondents for medical help after retirement from playing professional football
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Figure 6.8. Level of contribution provided to respondents for financial help after retirement from playing professional football

Figure 6.9. Level of contribution provided to respondents for career advice after retirement from playing professional football
Figure 6.10. Level of contribution provided to respondents for educational requirements after retirement from playing professional football

6.3.3 Players’ perceptions

Support services during playing career

Figure 6.11 shows the respondents’ perceptions of the support provisions available to them whilst they played professional football. There were significant differences in the proportion of players’ levels of satisfaction / dissatisfaction with the available medical science ($\chi^2=55.8, p<0.001$), sports science ($\chi^2=25.1, p<0.001$), and education / welfare services ($\chi^2=63.3, p<0.001$). Some 63.0% (114) expressed a level of satisfaction (either very or slightly satisfied) with the medical support, which they received during their time as professional footballers. This level of satisfaction decreased by approximately two thirds for sports science support (40: 23.3%) and education / welfare support (32: 18.9%).
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Figure 6.11. Players' satisfaction levels with support services during their professional football-playing career

There were no significant differences in respondents' perceptions of the medical, sports science, or welfare/education services as a function of age category, highest playing level achieved, or if respondents were categorised with and without medically diagnosed OA. However, when respondents were categorised according to retirement reason, viz. acute injury, chronic injury or other reasons, there was a significant difference in the levels of satisfaction with the medical service provision ($\chi^2 = 29.7, p < 0.001$), Figure 6.12. A smaller proportion of respondents expressed a level of satisfaction with the medical service provision if they retired from playing professional football due to acute injury (15: 45.4%) compared to chronic injury (26: 56.5%) or any other reason (63: 69.2%). This trend for levels of satisfaction was also evident in sports science services (acute – 2: 6.3%, chronic – 9: 20.0%, other – 24: 28.6%), Figure 6.13, and education/welfare services (acute – 2: 6.3%, chronic – 9: 20.4%, other – 16: 19.5%), Figure 6.14, but these differences were not significant.
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Figure 6.12. Players’ satisfaction levels with medical support services as a function of retirement reason

Figure 6.13. Players’ satisfaction levels with sports science support services as a function of retirement reason
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Other reason

Chronic injury

Acute injury

Figure 6.14. Players’ satisfaction levels with educational / welfare support services as a function of retirement reason

Influence of injury whilst playing / during retirement from professional football

Figure 6.15 shows respondents’ responses to a series of statements on the influence of playing professional football to their playing and non-playing careers. There were significant differences in the opinions expressed by respondents for all statements assessed. The majority of respondents strongly agreed or agreed with the statements that injuries obtained whilst playing professional would:

- reduce future income-earning potential (86: 48.6%) ($\chi^2 = 48.8, p < 0.001$).
- contribute to future medical problems (158: 89.3%) ($\chi^2 = 177.9, p < 0.001$).
- restrict the duration of their football playing career (125: 71.4%) ($\chi^2 = 74.1, p < 0.001$).
- affect their own playing performance and future career success (130: 73.4%) ($\chi^2 = 88.5, p > 0.001$).
- affect their team’s playing performance and success (143: 80.8%) ($\chi^2 = 138.3, p < 0.001$).
Figure 6.15. Players perceptions of the consequences of injury whilst playing / during retirement from playing professional football

There were no significant differences in respondents’ perceptions of the consequences of injury, as a function of age category, or for highest playing level achieved, with the exception of the impact of injury to duration of playing career. A greater proportion of 3rd (old 4th) division players (4: 50%) agreed that injuries would not limit their length of playing career compared to all other playing levels [International – 7: 9.9%, Premier (Old 1st) - 12: 11.0%, 1st (Old 2nd) - 2: 3.2%, 2nd (Old 3rd) – 2: 1.5%] ($\chi^2_{16} = 28.3, p < 0.05$). There were significant differences between OA and non-OA respondents in their level of agreement over the influence of injury on duration of playing career ($\chi^2_8 = 15.8, p < 0.05$), long-term medical problems ($\chi^2_8 = 23.4, p < 0.01$) and earning potential ($\chi^2_8 = 19.1, p < 0.05$). A greater proportion of OA players agreed with the statement that injury did limit the duration of their playing career (OA - 42: 73.7% vs. non-OA – 75: 68.8%). A greater proportion of OA players also agreed that injury would contribute to long-term medical problems (OA - 53: 91.4% vs. non-OA – 97: 86.6%) and would reduce future earning potential (OA – 30: 51.7% vs. non-OA – 48: 43.6%).

There were significant differences between respondents and their levels of agreement concerning the influence that injury can have on their playing and non-playing careers as a function of retirement reason, viz. acute injury, chronic injury and others. A greater proportion of acutely and chronically injured respondents agreed that injuries received whilst playing professional football would limit the duration of their football career (acute injury – 29:
87.9%, chronic injury - 38: 84.4%, others - 55: 62.5%) \( (\chi^2 = 20.4, p < 0.01) \). A greater proportion of acutely and chronically injured respondents agreed that injuries received whilst playing professional football would lead to long-term injury problems (acute injury - 31: 93.9%, chronic injury - 43: 95.6%, others - 75: 82.4%) \( (\chi^2 = 22.1, p < 0.01) \). A greater proportion of acutely and chronically injured respondents agreed that injuries received whilst playing professional football would limit their future earning potential (acute injury - 22: 66.6%, chronic injury - 27: 61.4%, others - 34: 37.4%) \( (\chi^2 = 23.1, p < 0.01) \). A greater proportion of acutely and chronically injured respondents agreed that injuries received whilst playing professional football would limit their future career opportunities (acute injury - 23: 69.7%, chronic injury - 25: 55.6%, others - 39: 42.9%) \( (\chi^2 = 33.7, p < 0.001) \). A greater proportion of acutely and chronically injured respondents agreed that injuries received whilst playing professional football would affect their individual playing performance and success (acute injury - 28: 84.8%, chronic injury - 34: 75.6%, others - 63: 70.0%) \( (\chi^2 = 26.3, p < 0.05) \).

**Willingness to reduce injury**

There was a significant difference in the proportion of respondents and the injury they would prefer to reduce by a half \( (\chi^2 = 29.4, p < 0.001) \). The majority of respondents indicated that they would reduce the proportion of strain injuries (82: 50.9%), followed by sprains (52: 32.3%) and fractures (27: 16.8%). On average, the respondents indicated they would be willing to pay 62.8 ± 93.6 (n = 73) days wages per year (17.2% of salary), to reduce their injuries over their career by half. If the level of injury doubled over their playing career, respondents indicated that they would expect to receive an extra 220.3 ± 195.0 (n = 54) days wages per year (60.4% of their existing salary) on top of their existing salary. The frequency distribution of responses for willingness to pay and willingness to receive are shown in Figure 6.16. Non-parametric statistics were used to assess for differences, as the distributions were not normally distributed.

There were significant differences in the number of days of wages per year that respondents would be willing to pay, to reduce their injuries by a half, as a function of retirement reason (acute injury: 105.9 ± 148.4, chronic injury: 84.7 ± 104.3, other: 34.9 ± 42.9) \( (\chi^2 = 7.0, p < 0.05) \). There were no significant differences in the number of days of wages per year that respondents would expect to receive, if their injuries doubled, as a function of retirement reason (acute injury: 317.6 ± 274.5, chronic injury: 251.8 ± 195.6, other: 151.3 ± 119.6). There was a non-significant tendency for respondents to be willing to pay more...
of their salary, if diagnosed OA, to reduce their injuries by fifty-percent (OA: 70.0 ± 96.3, non-OA: 53.0 ± 81.9). There was a non-significant tendency for respondents to accept a greater level of their salary, if diagnosed OA, if their injury rate doubled (OA: 263.6 ± 297.9, non-OA: 198.5 ± 127.7).

Figure 6.16. Frequency distributions showing the number of days wages respondents would be willing to pay to have injury rates reduced by fifty-percent and the number of day's wages they would expect to receive if their injury rate doubled

6.3.4. Past and present medical function

Overview: injury history and OA

There was a significant difference in the proportion of respondents who had been medically diagnosed OA in each lower limb joint ($\chi^2 = 55.4, p < 0.001$). More respondents had been diagnosed OA in the right and left knee joints compared to the ankle and hip joints. Of the total sample of respondents, 33.9% (59) had been medically diagnosed OA in at least one of the lower limb joints. A non-significantly greater proportion of respondents was diagnosed arthritic in the 70 and over age group, compared to other age categories [20-29: 0% (0), 30-39: 35.9% (15), 40-49: 35.0% (21), 50-59: 32.1% (9), 60-69: 42.1% (8), ≥ 70: 50.0% (6)].
Table 6.3 shows a summary of the injury history of respondents. There was a significantly higher proportion of respondents that had been injured, either on a moderate ($\chi^2 = 107.9, p < 0.001$) or on a major ($\chi^2 = 102.2, p < 0.001$) scale in the ankles and knees compared to the hip joints. There was a significant difference in the number of moderate ($F_{5, 975} = 19.0, p < 0.001$) and major ($F_{5, 976} = 12.8, p < 0.001$) injuries as a function of joint location. For both moderate and major injuries in the total sample, the number of injuries in both the right and left hips was different to all other joints ($p < 0.01$). The number of moderate injuries in the right knee also differed from the number of moderate injuries in the right ankle ($p < 0.01$). The number of moderate injuries in the left knee significantly differed from both right ($p < 0.03$) and left ankles ($p < 0.01$).

There were no significant differences in the age when surgery was first used and the age when OA was medically diagnosed, as a function of joint location. There was a significant difference ($\chi^2 = 55.4, p < 0.001$) in the proportion of respondents who had received surgery as a function of joint location.
### Chapter 6: The long-term impact of playing professional football

Table 6.3. Injury history of respondents in their lower extremities (n = 174)

<table>
<thead>
<tr>
<th>% respondents receiving moderate injury</th>
<th>Right hip</th>
<th>Left hip</th>
<th>Right knee</th>
<th>Left knee</th>
<th>Right ankle</th>
<th>Left ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.9</td>
<td>5.2</td>
<td>43.9</td>
<td>35.6</td>
<td>48.3</td>
<td>44.3</td>
</tr>
<tr>
<td>Av. no. of moderate injuries</td>
<td>0.1 ± 0.3</td>
<td>0.1 ± 0.5</td>
<td>1.2 ± 2.7</td>
<td>1.0 ± 2.6</td>
<td>2.3 ± 4.2</td>
<td>2.0 ± 3.8</td>
</tr>
<tr>
<td>% respondents receiving major injury</td>
<td>2.9</td>
<td>3.4</td>
<td>42.5</td>
<td>34.5</td>
<td>32.2</td>
<td>24.1</td>
</tr>
<tr>
<td>Av. no. of major injuries</td>
<td>0.1 ± 0.6</td>
<td>0.1 ± 0.7</td>
<td>0.8 ± 1.4</td>
<td>0.6 ± 1.1</td>
<td>0.5 ± 0.9</td>
<td>0.4 ± 1.1</td>
</tr>
<tr>
<td>% respondents receiving surgery</td>
<td>2.9</td>
<td>3.4</td>
<td>34.5</td>
<td>31.6</td>
<td>17.8</td>
<td>12.1</td>
</tr>
<tr>
<td>Av. age at surgery</td>
<td>38.4 ± 21.4</td>
<td>36.6 ± 19.5</td>
<td>27.8 ± 7.2</td>
<td>28.1 ± 6.5</td>
<td>25.4 ± 6.5</td>
<td>27.4 ± 5.7</td>
</tr>
<tr>
<td>% respondents diagnosed OA</td>
<td>1.7</td>
<td>4.0</td>
<td>19.0</td>
<td>21.3</td>
<td>5.7</td>
<td>6.3</td>
</tr>
<tr>
<td>Av. age respondent diagnosed OA</td>
<td>43.7 ± 28.0</td>
<td>42.4 ± 17.0</td>
<td>36.1 ± 12.8</td>
<td>35.2 ± 11.5</td>
<td>29.5 ± 4.2</td>
<td>31.6 ± 5.8</td>
</tr>
</tbody>
</table>

Physical activity loading patterns

Figure 6.17 shows the average total exposure for training as a function of stage of life and type of training. As professional footballers, respondents had a much greater total exposure rate for endurance ($F_{245,3} = 41.9, p < 0.001$), power ($F_{2,459} = 20.3, p < 0.001$) and football specific type training ($F_{2,451} = 143.5, p < 0.001$) than as schoolboys [professional vs. schoolboy: endurance ($p < 0.001$), power ($p < 0.001$), football specific ($p < 0.001$)] and during retirement [professional vs. retirement: endurance ($p < 0.001$), power ($p < 0.01$), football specific ($p < 0.01$)]. Schoolboy total exposure was also different to retirement exposure in power ($p < 0.001$) and football specific training activities ($p < 0.05$) [schoolboy - endurance: $526.0 ± 1103.9$, power: $80.9 ± 226.7$, football specific: $1702.5 ± 2081.7$; professional - endurance: $2060.2 ± 1746.7$, power: $916.2 ± 859.8$, football specific $5336.4 ± 3302.7$; retired - endurance: $675.4 ± 1878.1$, power: $528.7 ± 1783.0$, football specific: $889.5 ± 1617.4$].
However, these figures represent total exposure during the lifetime. To equate the three stages of career and lifetime, Figure 6.18 shows the average weekly exposure as a function of stage of career and type of training. There were significant differences for average weekly exposure in endurance ($F_{2, 472} = 32.6, p < 0.001$), power ($F_{2, 474} = 39.1, p < 0.001$) and football specific type training ($F_{2, 473} = 111.8, p < 0.001$). The average endurance, power and football specific training exposure was greater for professionals compared to schoolboy and retired career stages ($p < 0.001$). The average power and football specific training exposure was greater during the schoolboy stage compared to the retired career stage ($p < 0.001$).

![Figure 6.17. Total lifetime exposure in training](image-url)

Figure 6.17. Total lifetime exposure in training
Using the physical activity loading rates and the assumptions outlined in section 7.2.4, Figure 6.19 shows the OA frequency rates for each lower limb joint. On average, the OA frequency rate for the knees was 3.2 times greater than the ankle joints and 7.3 times greater than the hip joints (overall: 2.2, hips: 0.3, knees: 2.0, ankles: 0.6 per 100,000 hours).

Figure 6.19. DARs as a function of joint location
Chapter 6: The long-term impact of playing professional football

Playing whilst injured

Figure 6.20 and 6.21 show the type and frequency of medical support used by players to ensure they could train, Figure 6.20, and play competitive matches, Figure 6.21, whilst injured. There were significant differences in the number of respondents and the frequency of use for each medical support for both training and competition. More respondents indicated that they would have trained and played in competitive matches on a regular basis with medical help from supports and strappings [training - 58: 32.8% ($\chi^2 = 34.5, p < 0.001$), competition - 69: 39.2% ($\chi^2 = 44.0, p < 0.001$)]. More respondents indicated that they would have played whilst injured without any medical help from modalities during training ($\chi^2 = 17.8, p < 0.05$) and competition ($\chi^2 = 15.2, p < 0.01$) (never used - training - 52: 29.4%, competition - 46: 26.1%). More respondents indicated that they would not have taken medication to play whilst injured during training ($\chi^2 = 31.3, p < 0.001$) and competition ($\chi^2 = 23.1, p < 0.001$) (never used - training - 62: 35.0%, competition - 52: 29.4%). There were a significantly greater number of respondents that had never used non-steroid (training: $\chi^2 = 514.8, p < 0.001$; competition: $\chi^2 = 391.7, p < 0.001$) and steroid (training: $\chi^2 = 290.0, p < 0.001$; competition: $\chi^2 = 87.1, p < 0.001$) injections to play whilst injured during training (non-steroid – 156: 88.1%, steroid - 125: 70.6%) or competitive matches (non-steroid – 140: 79.1%, steroid – 77: 43.5%).

![Figure 6.20. Type and frequency of medical support used to play whilst injured during training sessions (n = 174)](image-url)
Figure 6.21. Type and frequency of medical support used to play whilst injured during competitive matches (n = 174)

There was a significantly greater proportion of respondents who had been medically diagnosed OA, who indicated that they had regularly (more than five times per season) had steroid injections to enable them to play in competitive matches, Figure 6.22 ($\chi^2=18.1, p<0.05$) [Never – OA: 19, Non-OA: 53; Rarely – OA: 18, Non-OA: 31; Occasionally - OA: 8, Non-OA: 16; Frequently - OA: 6, Non-OA: 5; Regularly: OA: 9, Non-OA: 4]. There was a non-significant trend for respondents who had been medically diagnosed OA to indicate that they had regularly had steroid injections to enable them to train, Figure 6.23 [Never – OA: 39, Non-OA: 78; Rarely – OA: 7, Non-OA: 18; Occasionally - OA: 6, Non-OA: 8; Frequently - OA: 2, Non-OA: 4; Regularly: OA: 6, Non-OA: 1].
Figure 6.22. The use of steroid injections to play whilst injured in competitive matches as a function of osteoarthritic status

Figure 6.23. The use of steroid injections to play whilst injured in training as a function of osteoarthritic status
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Present joint function

Table 6.4 shows the frequency of respondents that reported some form of joint pain as a function of OA diagnosis. A significantly greater number of respondents reported joint pain in one of the lower extremity joints during one or more daily activities compared to the number of respondents that did not report any pain (joint pain - 134: 79.8%, no joint pain - 34: 20.2%) ($\chi^2 = 59.5, p < 0.001$).

Within the total sample there were significant differences in the number of respondents that reported joint pain in the daily activities of getting up ($\chi^2 = 11.2, p < 0.05$), sitting ($\chi^2 = 20.4, p < 0.01$), standing ($\chi^2 = 17.1, p < 0.01$), climbing stairs ($\chi^2 = 21.4, p < 0.01$), walking over one kilometre ($\chi^2 = 21.4, p < 0.01$), and squatting ($\chi^2 = 77.5, p < 0.001$). In all activities, more respondents reported pain in the knee joints, followed by the hip and then the ankle joints. For the right ($\chi^2 = 42.0, p < 0.001$) and left ($\chi^2 = 39.5, p < 0.001$) knee joints and the right ($\chi^2 = 11.2, p < 0.05$) and left ($\chi^2 = 13.6, p < 0.05$) ankle joints, there were significant differences in the frequency of respondents reporting pain for each daily activity. For the right and left knees, more respondents reported pain in squatting compared to all other daily activities. In the left and right ankle, more respondents reported pain when climbing stairs, walking more than 1 km and squatting, compared to all other daily activities. The sample of respondents was also categorised as to whether they had been medically diagnosed with OA in each lower limb joint and whether joint pain had been reported, Table 6.5.
### Table 6.5 Proportion (%) of respondents reporting joint pain from static and dynamic daily activities (n = 173; *n = 172).

<table>
<thead>
<tr>
<th>Joint</th>
<th>Static Activities</th>
<th>Dynamic Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any daily activity</td>
<td>Sleeping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left hip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>8.1</td>
<td>3.9</td>
</tr>
<tr>
<td>- OA</td>
<td>2.9</td>
<td>1.2</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>5.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Right hip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>6.9</td>
<td>3.5</td>
</tr>
<tr>
<td>- OA</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>6.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Left knee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>36.4</td>
<td>4.6</td>
</tr>
<tr>
<td>- OA</td>
<td>17.3</td>
<td>4.0</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>19.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Right knee*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>36.6</td>
<td>7.0</td>
</tr>
<tr>
<td>- OA</td>
<td>16.3</td>
<td>5.2</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>20.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Left ankle*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>16.3</td>
<td>1.2</td>
</tr>
<tr>
<td>- OA</td>
<td>2.3</td>
<td>0.0</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>14.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Right ankle*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All</td>
<td>18.0</td>
<td>1.2</td>
</tr>
<tr>
<td>- OA</td>
<td>2.9</td>
<td>0.6</td>
</tr>
<tr>
<td>- Non -OA</td>
<td>15.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

In general, when all activities were summed, the results indicated that more respondents significantly reported minor to moderate pain in the right hip joint (minor: 29, moderate: 19, severe: 5, very severe: 0) ($\chi^2 = 16.5, p < 0.001$). This was non-significant for the left hip joint (minor: 25, moderate: 21, severe: 12, very severe: 0). A significantly greater number of respondents indicated that they suffered minor to moderate pain in the right knee (minor: 123, moderate: 56, severe: 23, very severe: 3) ($\chi^2 = 180.5, p < 0.001$) and left knee (minor: 101, moderate: 39, severe: 27, very severe: 1) ($\chi^2 = 128.5, p < 0.001$) joints. A significantly greater number of respondents indicated that they suffered minor to moderate pain in the right ankle (minor: 64, moderate: 13, severe: 4, very severe: 0) ($\chi^2 = 77.6, p < 0.001$) and left ankle (minor: 52, moderate: 11, severe: 6, very severe: 0) ($\chi^2 = 55.4, p < 0.001$) joints.
6.4 DISCUSSION

The aim of the present study was to investigate the long-term medical and socio-economic consequences associated with playing professional football. The study has shown that nearly half of all professional footballers in the sample retired from playing due to injury, which was classified either as an acute injury (19.0%) or as a chronic condition (26.4%). More players that retired due to acute and chronic injury, compared to other retirement reasons, indicated that they were dissatisfied with the medical support services available to them whilst playing professional football. The vast majority of former players perceived that injury would influence their socio-economic status after retirement from playing professional football, and their individual and team playing success whilst they were still playing. In addition, just over one third (33.9%) of players had been medically diagnosed OA in at least one of the hip, knee or ankle joints, but nearly four fifths (79.8%) of all players exhibited pain symptoms in at least one of those joints.

6.4.1. Questionnaire response rate

Thirty-seven percent of the sample responded to the survey within eight weeks of the distribution date. This is just less than the 40% response received from senior football club physiotherapists, Chapter 4, but compares favourably with other football industry based questionnaires and similar small and medium based enterprise questionnaire response rates (see section 4.3.1).

The sample of respondents indicated that the majority of respondents had played at the top levels of English professional football (International and Premier / ‘Old’ First division) at some point during their careers. In this instance therefore, the majority of respondents would have first hand experience of the highest quality and availability of support services within English professional football during their playing career. The discussion and conclusions are therefore made in the light of this support service availability. Although there were fewer goalkeepers within the sample of respondents, this is representative of the number of goalkeepers that are employed within professional football clubs. Assuming that each club (92 league clubs) has two professional goalkeepers in a total population of 2600 professional footballers (Football League Ltd, 1998, personal communication), the relative proportion of goalkeepers (7.1%) is similar to the sample in the present study (5.9%). The relative proportions of outfield players in the sample were similar between defenders, midfielders and forwards and no different from a 1: 4: 4: 2 formation, providing a representative sample in respect of playing position.
Chapter 6: The long-term impact of playing professional football

6.4.2. Player retirement: medial considerations

The present study showed that within the sample of respondents the greatest proportion of players retired from playing professional football due to injury (45.4%). In the present study, 26.4% retired due to chronic injury and 19.0% retired due to acute injury. It is more likely that acutely injured players will remain on the P.F.A. database due to the additional help they may have required during the period of consolidation from the acute injury.

In the present study the major injury location for acute injury retirement was attributed to the knee (42.9%), followed by the ankle (20.0%) and lower back (14.3%). Windsor Insurance Brokers (1997) have also reported these three injury locations as the major contributors for all permanent total disabilities within English professional football from 1987/88 to 1994/95 (knee: 49.3%, back: 16.9%, ankle: 12.9%). Furthermore, prospective injury audits within English professional football have reported that the ankle and knee account for a major proportion of non-career ending injuries (Lewin, 1989; McGregor and Rae, 1995; Hawkins and Fuller, 1999). However, the proportion of non-career ending back injuries represents a relatively small proportion of all injuries in English professional football (Lewin, 1989; McGregor and Rae, 1995; Hawkins and Fuller, 1999) compared to its significance as a career ending chronic injury.

Fuller and Hawkins (1997) have suggested that a significant proportion of players leave professional football due to chronic injury. The proportion of former players who have retired from playing professional football due to chronic injury in the present study (26.4%) supports this suggestion. The major injury location for chronic injury retirement was attributed to the knee (45.9%) and lower back (27.0%). The high level of chronic injury in the lower back compared to the low level of lower back injuries reported in prospective studies is a cause for concern. It is likely that the minor traumas to the lower back are insignificant enough to prevent players from training or playing and therefore being recorded within prospective work. However, the long-term consequences from this repeated trauma are significant to a player’s future health status.

The present study has highlighted that in conjunction with acute injury, the knee joint is the most dominant site responsible for player retirement from professional football due to injury. The proportion of chronic injury retirements due to lower back injuries is also significant and a cause for concern because of the relatively small proportion of non-career ending back injuries reported in prospective football injury audits (Lewin, 1989; McGregor and Rae, 1995; Hawkins and Fuller, 1999). Raty et al (1997) have also reported on back pain in footballers as
a consequence of twisting, falling and previous back injuries in their sample of players. Although respondents in the present study were not asked to report on pain in the lower back, due to constraints in the questionnaire design, some respondents did indicate a history of back trouble. Despite the low prevalence reported in prospective injury audits, it appears that there are major consequences associated with this small proportion of injuries. It also highlights the ineffectiveness of prospective work to record these instances of injury.

6.4.3. Player retirement: socio-economic considerations

Immediately at the point of retirement, whether planned or unplanned, former players face many decisions regarding their medical, financial, educational and career desires. The present study has shown that the PFA was the largest provider of advice and aid (medical: 33.7%, financial: 49.1%, career: 40.6%, education: 45.7%). It was clear that many players did not seek any additional help from the PFA or any other organisation, but for those players that did seek additional help, the PFA was the organisation most commonly quoted by respondents. Furthermore, more respondents in regard to medical, financial, educational and career requirements deemed the scale of help provided by the PFA as major. This is significant considering that the PFA has established the majority of its player benefit projects only in the past 20 years, e.g. Football League players non-contributory cash benefit scheme (1980), players contributory pension scheme (1985), PFA Financial Management Ltd. (1989) to manage player contracts, pensions, mortgages (www.thepfa.co.uk). The close-knit peer group of players was also demonstrated when players sought advice and help at the point of retirement from their fellow professionals. The slight to moderate level of support provided was more evident with advice and recommendations on medical, educational and career issues. Where additional financial help was required, the Football League and personal insurance policies helped a significant number of respondents. Where additional medical help was required, club and personal insurance policies helped cover costs. However, the number of players who had any personal insurance to support themselves was still relatively small among respondents, with only 14.3% and 16.6% having any cover for medical and financial reasons, respectively.

The present study has shown that once players retire from playing professional football, a significant proportion remain within the football industry in an alternative capacity, either as a coach, scout, or manager at either youth, reserve or first team level. However, there are only limited employment opportunities within professional football, and these cannot cater for the population of former players who wish to remain in the game. For the more famous and higher level players it became evident that after dinner speaking and media work
predominated as their new profession. For the players who failed to reach such celebrity status, many moved into self-employment through retail ownership, taxi driving, security jobs, construction work or cleaning. This is certainly an area of concern for the majority of former players, who have not previously obtained a suitable education for career development. This has been partly addressed by the new football academies that have been installed in some Premier and Football League clubs through the Football Association’s ‘Charter for Quality’ (Wilkinson, 1997). Academy youth players now receive educational guidance in addition to their football development to prepare them for a career outside of professional football. However, there is a generation of current players who will face the same predicaments as their predecessors in obtaining a new career.

6.4.4. Players’ perceptions: support services

A recent report has highlighted important issues that currently surround the employment and practices of physiotherapists and club doctors within professional football clubs (Waddington et al., 1999). The primary concerns of that report were focused on appointment practices of club doctors and physiotherapists, continual professional development, investment in medical care, players’ rights and establishing good practice. The Football Association are currently in discussion to introduce new measures to address some of the issues raised within the report (Hawkey, 2000). However, to obtain a complete picture, players’ perceptions of these issues are also an important component. The present study has shown that the majority of players were satisfied (63.0%) with the medical support provided to them during their time as professional footballers. This is despite the fact that the Football and Premier League (Premier League, 1998) have only recently introduced guidelines and requirements for all medical staff working within professional football clubs. It is possible therefore those respondents were unaware of what constituted good practice and accepted the advice of the club physiotherapist and doctor without looking for external advice. However, a significant proportion of respondents (24.3%) indicated a level of dissatisfaction with the medical support. The diversity of qualifications, training and experience of medical staff within English professional football (Drawer and Fuller, 1999; Waddington et al., 1999) linked with the levels of acute and chronic injuries, and the significant level of dissatisfaction amongst players with medical support, could lead to future negligence claims by professional footballers. It is important that the ruling football organisations develop an internal compensation process to reduce this potential litigation, to protect the image of the game and to enhance the welfare of all injured players.
Respondents were also asked to rate the support provision in terms of sports science and education / welfare services. These support services are relatively new in the English professional football industry so it was expected that there would be little positive comment on these services. Drawer and Fuller (1999) have shown that in the playing season 1997/98 professional football clubs were deficient in the provision of these services. Consequently, it would be expected that the services, if available, would be provided through the existing coaching and medical staff employed within the club. This deficiency was confirmed by the results of the present study, showing the low frequency of respondents who expressed a level of satisfaction with the provision of sports science services (25.6%) and education / welfare services (18.9%). Football club physiotherapists do not have the time on top of their existing schedules (Drawer and Fuller, 1999) to provide a high level of sports science and welfare / education support. The failure of football clubs to provide adequate services to ensure players' health and safety could be deemed as failure to comply with the MHSW (1992) regulations (Fuller, 1995). This may also lead to legal consequences for football clubs.

The levels of satisfaction with the medical, sports science and education / welfare services were also assessed as a function of retirement reason viz., acute injury, chronic injury and other reasons. If respondents had retired from playing professional football due to acute injury, they were more likely to be less satisfied with medical service provision (acute: 43.8%, chronic: 56.8%, other: 68.3%). Players are more likely to be frustrated by the medical service provision if a single, memorable, catastrophic injury leads to their demise as a professional footballer. Repeated injuries, which lead to chronic conditions, are less likely to be remembered as they are often considered part of the game (Waddington et al, 1999). The present study has shown that the experience of a career ending injury also reduced the proportion of respondents who expressed a level of satisfaction with sports science and welfare / education provision, but this was not statistically significant.

6.4.5. Players' perceptions: the influence of injury

The long-term influence of injury on professional footballers has been described and discussed in terms of sequelae (Solonen, 1966; Chantraine, 1985; Lindberg et al, 1993; Roos et al, 1994; Kujala et al 1994; 1995; Raty et al, 1997), socio-economic consequences (Hicks, 1998; Meir et al, 1997) and the influence on the playing and financial performance of the football club, Chapters 2 and 3. However, the perceptions of former players also make a significant contribution to these issues. The present study has shown that more respondents disagreed than agreed (49.1% vs. 27.3%) with the statement that injury would influence their future career opportunities. It is suggested that this may be because the majority of
respondents remained in the professional football industry through scouting, coaching and managerial posts, and therefore players were satisfied with their career progression.

The present study has also shown that more respondents strongly agreed or agreed, compared to strongly disagreed or disagreed, with the statements that injury would have an influence on their future income earning potential (48.6%), future medical problems (89.3%), duration of playing career (71.4%), individual (73.4%) and team playing performance (80.8%). This evidence therefore, generates concern over the financial and medical issues that arise from players retiring through injury. There are potential courses of action through litigation, if players perceive that playing professional football has hindered their career development and their future medical condition. Gordon Watson was recently awarded £1M compensation for a tackle injury that restricted his professional football playing development (Bunyan, 1999). Furthermore, there are concerns for the club senior management as player absence can influence the playing and financial performance of their team, Chapters 2 and 3. However, the investment in resources to manage players' health and safety and reduce the risks of player injury is poorly understood, as illustrated by the failure of clubs to invest in appropriate injury prevention support services (Drawer and Fuller, 1999) and players' poor knowledge of injury prevention strategies (Hawkins and Fuller, 1998). Ultimately, the chairman and senior management teams are responsible for the health and safety of their employees and at present, they are failing to fulfil their health and safety obligations under the MHSW (1992) Regulations.

Of more concern for the football authorities is that the present study has shown that more respondents, who were diagnosed OA in one of the lower limb joints, agreed with the statement that injury limits the duration of their professional football playing career. More OA diagnosed respondents tended to agree that injury would contribute to long-term medical problems and reduce their future earning potential. It is evident therefore that those respondents who were diagnosed OA have greater concerns over their socio-economic status when they retire from playing professional football. Retirement reason was an additional independent factor, which significantly differentiated between respondents' opinions on the influence that injury can have on socio-economic status and playing performance. In the majority of cases, more respondents who retired due to acute or chronic injury agreed with the statements that injury would limit the duration of their football-playing career and lead to long-term medical problems. This sample of respondents also agreed that injury would limit their future earning potential, limit their future career opportunities and limit their personal achievement within the industry. This has important ramifications for the organisations that control professional football. Without establishing a strategy to provide suitable assistance to
players who have to retire due to acute or chronic injury, former players are likely to feel aggrieved by the support provided to them. Consequently, these former players may seek alternative methods to ensure they are rewarded for their endeavour as professional footballers.

6.4.6. Players’ perceptions: willingness to reduce injury

The hypothetical questions, which assessed respondents’ willingness to contribute to injury reduction and the money they would expect to receive for a higher risk of injury follow an established procedure in health and safety management. It is predominantly used in cost benefit analysis to calculate the potential benefits of investment projects.

The present study showed that if there was a choice, the majority of respondents would reduce the frequency of muscle strain injuries (50.2%) compared to ligament sprains (32.3%) and fractures (16.8%). Therefore, respondents are more concerned with the incidence of muscle strains, which can be accounted for by the greater likelihood of players experiencing strains in English professional compared to sprains and fractures (Lewin, 1989; Hawkins and Fuller, 1999). However, results presented in Chapter 3 have shown that fractures provide the greatest risk to the club and for the player, followed by sprains and then strains, when expressed as the product of injury frequency and severity.

The present study showed that on average respondents would be willing to sacrifice 17.2% of their salary per annum if they could reduce the incidence of their injuries. Respondents also reported that they would expect to receive an extra 60.4% of their salary if their injury rate doubled. There was a non-significant tendency for OA respondents to be willing to pay more than non-OA respondents to reduce the level of their injuries by fifty-percent [OA: 70.0 ± 96.3 days (19.2% salary); Non – OA: 53.0 ± 81.9 days (14.5% salary)]. There was also a tendency for OA respondents to expect a greater salary in exchange for a doubling of their injury rate [OA: 263.6 ± 297.9 days (72.2% salary); Non – OA: 198.5 ± 127.7 days (54.4% salary)]. Respondents were also categorised according to retirement reason, viz. acute injury, chronic injury and others, with significant differences obtained between respondents who had retired due to acute injury and all other reasons. Acutely and chronically injured respondents were willing to pay two to three times more of their salary per annum than respondents who had retired for other reasons (acute: 29.0%, chronic: 23.2%, others: 9.6%). Acutely injured respondents would have expected to receive twice as much of their salary per annum if the injury rate doubled, compared to respondents who had retired for other reasons (acute: 87.0%,
chronic: 69.0%, others: 41.4%). It is evident that the experience of respondents who had retired from playing professional football through acute and chronic injury, or if diagnosed OA, had influenced their perceptions of injury. Consequently, it is important that the football organisations ensure that such individuals receive the appropriate support.

6.4.7. Prevalence of OA

The prevalence of medically diagnosed OA in the sample of respondents (33.9%) is less than that reported for another sample of former English professional footballers (49%) (Hicks, 1998). However, in the present study, a broader cross-section of players were included with lower mean ages at diagnosis of OA, for all joints, (30.2 vs. 39.0 years) and the mean age of the sample (47.6 vs. 56.1 years) (Hicks, 1998). In the general male population, the prevalence of moderate or severe OA is less than 10%, for the age range 35 to 44, and approximately 20%, for the age range 45 to 54 (Kellgren and Lawrence, 1958; Lawrence et al, 1966). In the Royal College of General Practitioners (1988) morbidity survey, the prevalence of symptomatic OA for males in the 25 to 44 and 45 to 64 age group was 5% and 30%, respectively, over the period 1981 to 1982. These OA prevalence rates are substantially less than the value reported for the present sample of respondents.

The results for the diagnosis of OA are confounded by the inconsistencies that exist in the medical diagnosis, which is based on radiographic findings (McAlindon and Dieppe, 1989). Actual diagnosis of OA can only be confirmed by radiography, which is the most available method for detecting changes in articular cartilage (joint space narrowing) and tissue reaction about the joint (Altman et al, 1986). The first diagnosis system proposed by Kellgren and Lawrence (1957) placed the emphasis on identifying osteophytes. However, the criteria proposed by Kellgren and Lawrence (1957) were inconsistent for all joints (Nevitt, 1996) and led to the development of alternative criteria (Altman, 1991; Chantraine, 1985; Lequesne and Samson, 1991; Roos et al, 1994; Kujala et al, 1994; 1995). Unfortunately, there is currently no uniform standard classification system with 100% specificity and sensitivity as biopsy is often impractical for confirming the presence of OA in all patients. Therefore, the results from the present study must be considered in the light of the issues surrounding technological developments in the medical industry.

To supplement the confirmation of medical diagnosis, respondents were also asked to report on the potential symptoms that are associated with joint OA. The major consequences and symptoms of joint OA are pain in soft tissue structures such as ligaments, tendon insertions, bursae, which leads to impaired function. Joint pain and functional impairment are the two
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clinical sequelae of OA most relevant to epidemiological studies (Cooper et al., 1996). The joint pain is often described as worse with joint movement or weight bearing but it often eases and then worsens with continual activity (Hutton, 1995).

The procedures for reporting of pain in daily activities that were used within the present study have previously been used by the Kujala et al (1994; 1995), Raty et al (1997) and Lequesne and Samson (1991) as a symptom of OA joint pain. However, Kujala et al., (1995) used a seven point pain scale and Raty et al (1997) used a one hundred point pain scale. The categories used in the present study have been validated and reproduced as an index of severity for the hip and knee joints (Lequesne and Samson, 1991). In the present study, 79.8% of respondents reported joint pain in at least one of the daily activities. In comparison, joint pain reported in general populations varies between 40% to 80% (Spector and Hart, 1992). The joint pain in the present study tended to be in the more dynamic activities of climbing the stairs, walking over one kilometre and squatting. The frequency with which respondents reported joint pain was also greater for the knee joints, which can be attributed to the greater number of injuries, incidence of surgical interventions and prevalence of OA within the knees. The level of pain also tended to be on a higher scale in the knee joints for a greater number of respondents. Hicks (1998) also reported that the knee joint was the most common location reported for diagnosis of OA in professional footballers.

6.4.8 Injury history, joint loading and the prevalence of OA

Respondents were asked to identify the number of moderate and major joint injuries received in all of the lower limb joints (hips, knees and ankles) whilst playing professional football. The lower limbs were the most frequently injured locations in British professional football (Lewin, 1989; McGregor and Rae, 1996; Hawkins and Fuller, 1999) and are also the only joints where any evidence is available to identify the onset of OA in former professional footballers, Table 6.1. The length of injury absence viz. moderate, major, was selected because it is more likely that there would be cartilage and / or ligament damage in more severe injuries. Cartilage degeneration and ligament damage due to such injury severity have been shown to be strong risk factors for the onset of OA (Jackson, 1968; Jacobsen, 1977; Chantraine, 1985; Neyret et al, 1993).

The present study has shown that on average respondents received a higher quantity of moderate ankle and knee injuries than hip injuries. However, there were a greater number of major knee injuries in the sample, which resulted in a higher proportion receiving knee surgery and being medically diagnosed OA compared to the ankle and hip joints. Hawkins
and Fuller (1999), Lewin (1989) and McGregor and Rae (1995) have all shown that knee and ankle injuries in UK football account for a greater proportion of reportable injuries than do hip injuries. The trend is also similar in European and American studies as reviewed by Keller et al (1987) and Larson et al (1996). Furthermore, it has been demonstrated that moderate and severe injuries to the lower limb joint cartilage and ligament structures both predispose the joints to OA (Jackson, 1968; Jacobsen, 1977; Chantraine, 1985; Neyret et al, 1993). It has also been suggested that the relatively high prevalence of knee OA in high level football is due to the increased risk of knee injuries in the meniscus and anterior cruciate ligament (ACL) and due to the high loading on hip and knee joints (Roos, 1998).

To provide additional evidence on the extent of joint injury, details were obtained on the surgery required for the joints and the age at which surgery occurred. After surgical intervention there tends to be a delay period before OA can be detected through clinical and radiographic means (Roos, 1998). In the present study, the average age for ankle and knee surgery was lower than the age for hip surgery by ten to eleven years (hips: 37.5, knees: 28.0, ankles: 26.4 years). Muckle (1983) reported that in a group of ninety-one footballers, fifty of whom were professional, the average age at the time of knee surgery was 23.9 years. This was earlier than for the respondents in the present study. Muckle (1983) also found that all players had been diagnosed with OA within ten years of surgery. The changes in the bone pathology used to define OA were more accelerated in the professionals.

In the present study, respondents were more likely to receive surgery on the hip at a higher average age compared to the knee and ankle joints. The age at surgery has an influence on the development of OA. Neyret et al (1994) have shown that if footballers received a knee injury before 35 years of age there tended to be a mean delay of 26 years before OA could be detected. If the knee injury occurred after 35 years of age there was average mean delay period of 10 years before OA could be detected (Neyret et al, 1994). However, Boszotto et al (1994) cited in Lane (1996) have shown that the delay from injury to the detection of clinical OA varied from two to seven years for patients with mild to moderate OA. In the present study, respondents reported medically diagnosed OA at an age that was relatively close to the average age at surgery, Table 6.3. The difference in years from surgery to OA diagnosis ranged from 4.1 to 8.3 years supporting the evidence presented by Boszotto et al (1994) cited in Lane (1996). The shorter duration from surgery to OA diagnosis can be accounted for by the fact that prior to surgery players were already experiencing the pathological changes that are associated with joint destruction. These changes would include defective integrity of articular cartilage, changes in the underlying bone and changes at the joint margins (Altman et al, 1986).
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The training and competition loading patterns of respondents were used, in the present study, to calculate the DARs. These were obtained from the time spent during various forms of training, which was classified as either endurance (continuous running) power (weight training) or specific football activities (sprinting, 5-a-side, turning, and twisting). The specific forms of training are confounding factors associated with musculo-skeletal pain and the risk of joint OA (Kujala et al, 1994; 1995; Raty et al, 1997). In the present study, the average weekly exposure for First team players was significantly higher than respondents' time as Youths or Retirees. At all stages of respondents' lifetimes, they spent significantly more time on football specific training, which is a higher risk factor for joint OA (Kujala et al, 1995). Respondents also used power and weight training, which provides evidence that former players engaged in some form of injury prevention training, although the detail of the format of this training is unknown.

Kujala et al (1995) and Raty et al (1997) provide a breakdown of lifetime weekly average exposures for endurance (1.1 hours), football specific (3.5 hours) and power training activities (0.1 hours) in elite Finnish footballers. These Finnish footballers' average age was 56.5 years, which is nearly ten years higher than in the present study. In the present study, the average numbers of hours training per week were 2.0 hours (endurance), 5.5 hours (football specific) and 0.9 hours (power training). The higher levels of exposure recorded by respondents, in the present study, may account for the earlier age at which OA was diagnosed. Klunder et al (1980) have reported an exposure time in a sample of footballers of 6.7 hours per week for 22.8 years. This sample of players had a greater prevalence of OA compared to a control group in the ankles (52.7% vs. 33.3%), hips (49.1% vs. 26.3%) but not the knees (14.0% vs. 12.3%). It is suggested that these prevalence rates differ from the present study because of the varied definitions and interpretations used to define OA with different individuals and sample groups.

Using the total exposure rates from respondents' replies, it was calculated that the DARs per 100,000 hours of exposure were greatest for the knee joints (2.0) followed by the ankles (0.6) and hips (0.3). A comparison of the DARs presented here with acute injury exposure rates presented by Hawkins and Fuller (1999) indicates that, on a probabilistic basis, one case of OA in a professional footballer is likely to occur for every 390 acute injuries, or alternatively, the equivalent of three Premier League player being diagnosed with OA every season played.

Cooper et al (1996) have identified that there is clear epidemiological evidence that professional football, as an occupation, does contribute to the risk of OA at the hip and knee. However, the weight of evidence may not be sufficient to tip the balance in favour of
compensation for players in this occupation (Cooper et al, 1996). This supports the decision of the Industrial Injuries Scheme, as part of the Contributions and Benefits Act 1992, not to register professional football under this Act. However, the present study has clearly indicated that there is cause for concern, which should encourage the football authorities to invest in a longitudinal project to monitor the medical status of a sample of professional footballers.

Although there were no control groups in the present study from which to compare the incidence of medically diagnosed OA, there are population studies that describe the prevalence levels of OA for comparison (Croft, 1996; Petersson, 1996). It must be noted that these figures are dependant on the population, gender, epidemiological technique, age, among many other factors (Petersson, 1996). The prevalence of hip OA has been reported as 8.4% in males over 55 years of age (Kellgren and Lawrence, 1958) and 3% in 45 – 49 year old Dutch males (van Saase et al, 1989). The prevalence figures in the present study are for a younger population but are still similar (right hip: 1.7%, left hip: 34.0%) to the other population studies. The prevalence figures for radiographic OA of the knees was between 14% and 30% in males over the age of 45 (Spector and Hart, 1992). In 55 to 64 year old males, the prevalence of radiographic knee OA was 29.8% (Kellgren and Lawrence, 1958). The prevalence of knee OA in the present study was 19.0% (right knee) and 21.3% (left knee) but in a much younger age group. In the ankles, an OA prevalence figure of 2% in a male, age-matched control population was much less than for a group of footballers (31%) studied previously (Solonen, 1966) and for the footballers in the present study (left ankle: 5.7%, right ankle: 6.3%).

6.4.9. Playing whilst injured

There is a culture within professional football that leads to professional footballers training and playing in competitive matches whilst not being completely fit (Waddington et al, 1999). The fact that this practice is evident is demonstrated by the risk of re-injury in professional football being relatively high (Hawkins and Fuller, 1999). Players are under pressure to play in all competitive matches for personal reasons, or as a result of pressure from their management and medical team (Waddington et al, 1999). By playing under these conditions, it is more likely that a player, who receives a similar injury in the same location within a two month period, will receive a more severe injury and a greater level of cartilage and ligament damage (Ekstrand and Gillquist, 1983). Damage to such soft tissues is a strong risk factor for the development of joint OA (Roos, 1998). Therefore, former players were asked to identify the frequency of occasions and the level of medical help they had received to ensure that they
could play in a competitive match or to train. It was assumed that the higher the level of medical support given to players the greater the risks of re-injury.

There were a number of respondents, who indicated that they have never played or trained whilst injured regardless of the medical support that was available. The reason for this could be based on respondents’ definition of injury. It has been identified previously that players perceive that they are never completely fit, always carrying some minor injury from a previous training session or match (Waddington et al, 1999; Hicks, 1998). It is possible therefore that the definition of injury for respondents is one that does not permit them to train or play regardless of the available medical support. Respondents, who had played or trained whilst injured, were more likely to have used supports / strappings, modalities or medication to ensure they could engage in their work. The use of steroid injections to enable respondents to play was much greater for competition than for training (steroid - competition: 56.5%, training: 29.4%; non-steroid - competition: 20.9%, training: 11.9%). Hicks (1998) has similarly reported that in a sample of 284 footballers, 59% indicated that they had a steroid injection in their playing career. In the modern game, medical staff and club management are generally more educated towards the consequences of such practices. Kevin Keegan, the current England football coach, recently commented on an anti-inflammatory injection given to Alan Shearer two days before a vital European Championship finals game (Winter, 2000),

'It's normal procedure.... I have to stress it's not a pain-killing injection. It's done the business. I said in January I would not give players pain-killing injections to play in games.'

Within the same article however, Winter (2000) explained that this situation 'was far removed from the morning-of-the-match cortisone jab to push a lame star through a key game'. Furthermore, it has been shown that players tend not to be educated about the potential consequences of steroid injections and even if they were, they had an injection regardless (Hicks, 1998). In the present study, the results showed that a far greater proportion of respondents who had regularly received steroid injections to ‘play whilst injured’ were diagnosed OA, Figures 6.22 and 6.23. Although the number of respondents that had regularly used steroid injections was relatively small (competition: 13, training: 7) the results clearly indicate the long-term risks associated with such injections on a regular basis. Therefore, the elimination of this medical practice is encouraged to reduce the long-term risks to professional footballers.
6.5 CONCLUSIONS

The present study has highlighted many important issues for professional footballers and the ruling organisations within professional football. The results clearly illustrate the need for a strategy within professional football to combat the risks associated with a career in professional football. Although a control group was not used in the present study, there are established studies, Table 6.1, which have illustrated the greater prevalence of OA in professional footballers than other sporting and non-sporting populations. The aim of the present study was to quantify the prevalence of OA in English professional football and its medical and socio-economic consequences, rather than to test if the prevalence of OA was significantly greater than comparative populations. The methodology used in terms of a retrospective questionnaire would not be the most appropriate tool to use to assess this hypothesis. However, an important finding was that regardless of whether OA had been diagnosed, players reported some of the symptoms associated with the degenerative bone disease. Therefore, the study provides preliminary information to justify the need for investment in a long-term clinical and medical prospective study tracking a sample of professional footballers to test this hypothesis.

In a recent case, Billy McPhail, a former professional footballer in Scotland appealed against a government refusal to grant him industrial injuries disablement payments due to previous injuries (Savill, 1998). Repetitive heading of an old style leather football had led to short term memory loss and some brain damage. A consultant psychiatrist advised the court that ‘the most likely factor to have caused damage was Mr McPhail’s previous occupation as a professional footballer’ (Savill, 1998). Although the case was unsuccessful, there is potential for similar cases to emerge if the medical consequences of playing professional football are not reduced. Previous evidence on OA in football players, which was submitted to the IIAC, has not led to any firm conclusions on whether compensation should be paid to professional footballers due to occupational hazards. It has been recommended that stronger prospective studies are required before firm decisions can be made (IIAC, 1995). For effective conclusions to be made a ten to twenty year wait will be required. A generation of professional footballers will therefore remain at high risk of OA, as the industry does not have any regulatory impetus to change the way the health and safety of players is managed. Organisations only tend to change when a major incident or event presents a poor image of that organisation (Wright, 1998). Results from the present study provide additional information for the ruling authorities on the perceptions and concerns of former professional footballers, on the influence that injury can have on the socio-economic and medical status of former players. This in itself should provide sufficient impetus for the FA to assess the impact.
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of injury in professional football. However, this does not seem to be the case as illustrated by Alan Hodson, the head of the F.A.'s Medical School at Lilleshall

‘In my opinion there is no more physically demanding sport than professional football – the pressures exerted on knee and ankle joints and on neck muscles are quite likely to lead to this type (OA) of problem in later life. It is part of the wear and tear of playing such a physically demanding game.’ (Hicks, 1998)

The PFA was the only notable organisation that was providing significant reactive support to former professional footballers. This organisation was identified as providing a major source of contribution and advice for players who had retired from playing professional football. The actions of the PFA reflect the close bonds between professional footballers rather than a contribution by the professional football industry. This is undoubtedly a strong characteristic of the organisation and industry culture. However, external consultancy may provide an alternative proactive viewpoint to drive the industry forward and develop a strategy for players' welfare and development.

The epidemiological analysis of acute and chronic retirement factors in professional footballers identified that the knee joint was the most common injury location leading to player retirement. This was also the site, which had the greatest prevalence of OA in the sample of former players. For the football organisations and employers to introduce appropriate measures and interventions to reduce the short and long-term risks associated with injury to this joint, there must be evidence to show that this can be achieved. Roos (1998) presents a series of studies that illustrates there are long-term sequelae from playing football. There are also substantial epidemiological data, which illustrate the high frequency and risks of knee injury in English professional football (Lewin, 1989; Hawkins and Fuller, 1999). From the evidence provided in medical and clinical OA studies, Table 6.1, it is clear that injury history and physical loading patterns associated with professional football are the two greatest factors responsible for the onset of OA. The present study has provided additional indirect links to these conclusions. Moves have been made by the English F.A. through the development of football academies to reduce the loading for elite youth players (Wilkinson, 1997) but the growth and speed of the game does little to compensate for reduced loading on players’ joints at the elite level. There are medical developments in the USA, which have led to the ability to regenerate cartilage and this may eventually provide protection against OA caused by cartilage degeneration (Harvard Orthopaedics, 2000, personal communication). However, the most important single factor appears to be the prevention of knee injuries and Caraffa et al (1996) have shown that this is achievable. By focusing resources on the
reduction of acute injuries there is likely to be a concomitant effect on long-term medical and socio-economic consequences.
6.6 STRENGTHS AND WEAKNESSES

The present study has provided detailed information on the socio-economic and medical consequences of a career as a professional footballer. The information complements the clinical studies that have shown the greater prevalence of OA in professional footballers compared to other populations, by providing additional information on the influence that these medical consequences have for professional footballers. The study has provided complementary medical data, which supports previous clinical work, Table 6.1, but develops the preliminary information on OA in professional footballers (Hicks, 1998). By using a holistic approach to understand the consequences of working in a high-risk industry, a multidisciplinary approach can be used to introduce intervention measures for the reduction of acute and chronic injury. Measures can also be introduced to define appropriate support to help former players who require social and economic support because of injury during their playing career. The study has provided information that justifies an investment by the appropriate ruling bodies on the medical and socio-economic consequences of playing professional football.

The main weaknesses of the study revolve around the methodology. The database of players maintained by the PFA directly influenced the type of player that was sampled. Those former players that remain on the PFA database are generally those that remain employed within the professional football industry or have used the PFA services on regular occasions. These players tend to be those that have retired due to acute injury or have required the help of the PFA in organisation of legal aid. Many other retired players fail to remain as part of the PFA organisation or as part of their former clubs’ alumni associations. It is also possible that the sample of respondents who returned the questionnaire are those individuals who have more reason to register their complaints and are more likely to report a problem. Therefore, the results and discussion must be seen in the light of this and in the light of the medical and sports science developments that are now emerging within the professional game. It is likely that scientific developments may reduce the incidence of acute and chronic injury and their associated medical consequences in the future.

The use of retrospective methods to recall injury history has also been identified as a weakness in sports injury epidemiological research (Phillips, 2000). However, despite the use of a retrospective methodology the results clearly followed the patterns in terms of injury risk, that have been identified by prospective football epidemiological studies (Lewin, 1989; McGregor and Rae, 1995; Hawkins and Fuller, 1999). This can be accounted for by the fact that players were asked to recall the more severe injuries, which were likely to be the more
memorable events. In addition, the more severe injuries would have the greatest influence on the development of OA. The questionnaire was deliberately designed to focus on important events in respondents’ lifetimes, which were likely to be recalled with greater ease and greater accuracy.
7.1 GENERAL DISCUSSION

7.1.1 Thesis structure

Within UK industry and business, the management of employee health and safety is approached using risk management principles. The risk management process leads to a quantification of the injury risks and the consequences of the outcomes from these risks (Royal Society, 1992). By obtaining this information, management can direct and invest in the resources to reduce the risk of accidents and injury, reduce the likelihood of litigation and improve the productivity of the organisation. The use of risk management in professional sport was first advocated by Fuller (1995) who pointed out that the professional sports person is subject to the same requirements of health and safety legislation as an employee in most other occupations.

The first logical procedure within risk management is risk identification followed by risk estimation, which leads to an identification of the outcomes from risk, the probabilities of these outcomes and an estimation of the magnitude of the consequences from these outcomes (Royal Society, 1992). Hawkins and Fuller (1996; 1998a; 1998b; 1999) have completed the majority of this process in English professional football. By adhering to the risk management principles the next logical process is to evaluate the significance of the identified risks to all parties concerned, or those that may be affected by any decisions involving the risks. There are many potential parties that will be influenced by the risks associated with professional football, Figure 1.6. The present thesis has focused on the significance to the clubs (employers) and their players (employees), which invariably have more influence over the implementation of health and safety measures and the fulfilment of government health and safety obligations (MHSW, 1992). The importance of managing these risks has become more evident with the growth in financial turnover and player value, which has escalated since the formation of the Premier League (Boon et al, 1999). The ramifications associated with the case of Michael Watson v. British Board of Boxing Control also highlight the growing concern with managing risk in professional sport (Fuller, 1999).

The risk estimation work published by Hawkins and Fuller (1996; 1998a; 1998b; 1999) has already identified some of the acute consequences of risk, which players experience.
However, there has been little work that has evaluated the consequences to the clubs. Club managers often describe the negative influence that player injury has to their selection and team-performance. There is a strong belief in the financial world that playing performance is strongly linked to financial performance, Table 1.3. Consequently, senior management should also be concerned about the negative influence of player absence through injury. In the present thesis, the evaluation of risk due to player injury for the football clubs and players was ordered in the following sequence to fulfil the aims of the research:

1. Design of an empirical framework model to assess the indirect influence of player injury on playing and financial performance and to assess risk reduction investment projects through cost benefit analysis (Chapter 2).

2. Definition of injury epidemiological data in a format appropriate for assessing ‘risk’ and the subsequent application of this risk data to the framework model to identify the influence of injury risk on playing and financial performance (Chapter 3).

3. Identification of existing support services within professional football clubs to highlight deficiencies in risk control and to indicate potential investment projects for injury risk reduction (Chapter 4).

4. Financial evaluations of deficiencies identified in the previous chapter were assessed through cost benefit analysis to test if investments in the recommended risk reduction and risk control procedures were reasonably practicable. This process was then applied to a case study to assess the practicalities of using risk management within this environment (Chapter 5).

5. The consequences of a career playing professional football were determined to identify how the high risks of acute injury influence the long-term well being of players. The focus of this risk evaluation was from a medical and socio-economic perspective (Chapter 6). It was assumed that a reduction in the risk, through the recommendations identified in Chapters 4 and 5, would also translate to the players and lead to a reduction in the long-term consequences.

The main findings of each component of the thesis, which constituted part of the risk evaluation process are expanded within the following section.

7.1.2. Thesis overview

By using published financial reports on the Annual Review of Football Finance, evaluating the ‘quality’ and playing performance of English professional clubs, an empirical risk management framework model was developed, Chapter 2. This model has many applications...
but in the context of risk management it was used for two major purposes. The first purpose was to illustrate the influence that theoretical injury levels in English professional football would have on the playing and financial performance of English professional clubs, Chapter 3. The second major purpose was to use the model as a framework for assessing potential risk mitigation projects, through the process of cost-benefit analysis, Chapter 5.

The risk framework model developed in Chapter 2 showed that strong, positive, log-log relationships existed between team-quality and team-performance, club-turnover and team-performance, club-turnover and club-salary, and team-quality and club-salary. Consequently, the four inter-dependent relationships were proposed to exist in a state of equilibrium, whereby changing one parameter would influence the status of the other three, Figure 2.7. For example, if a football club invested £20M in four new players of better quality than were already present, the increase in potential team-quality would theoretically lead to an increase in team-performance. An increase in team-performance would theoretically lead to an increase in club-turnover. By increasing the magnitude of club-turnover, the club would now have a greater resource to pay for the increase in club salary associated with the purchase of these four players. However, continual investment is required by the club management to maintain team-quality because any increases in turnover will lag behind team-performance. The changes must occur within a time frame that allows the new equilibrium position to become self-sustaining. The investment by former Blackburn Rovers Chairman Jack Walker is a good example of this phenomenon. The initial investment in new playing staff led to immediate playing success yet the longer-term financial returns could not sustain the turnover required to maintain team-quality and achieve a self-sustaining equilibrium state.

The major application of the model was to illustrate the influence that player availability, which impinges on available team-quality, would have on team-performance and club-turnover, Chapter 3. However, for this process to be evaluated accurately it was important to ensure that the relevant data were available. Unfortunately, the risks associated with sports injuries are traditionally expressed as an injury frequency rate (IFR), incidence rate or prevalence rate (Larson et al, 1996; Hawkins and Fuller, 1999). None of these methods describes the risk to either the players or their clubs. Risk is a function of the probability of an incident occurring (often expressed as an IFR) and the consequences associated with that injury. The injury severity can be defined as the nature of the injury, cost of treatment, quantity of permanent damage, or in the present thesis, as the duration of player absence (van Mechelen, 1997).
The risk-based evaluation illustrated some important facts. The prevailing injury absence rate used for later aspects of the risk evaluation was identified as thirteen percent of total work time, per player, per season. This injury absence rate was fifty times greater than the average absence periods for British industry employees.

The low frequency major injuries, which led to player absence of over one month, accounted for a relatively large proportion of the risk to the club and the player, e.g. fractures / dislocations. The high frequency of slight and minor injuries, which led to player absence of one day to one week, accounted for a relatively small proportion of the risk to the club and the player, e.g. contusions. This has important ramifications for the investment of resources into risk reduction measures. With many clubs failing to achieve a pre-tax profit at the end of each financial year (Boon et al, 1999), they have limited resources, which they can allocate to player health and safety issues. Consequently, they should allocate these resources effectively by reducing those injuries that present the greatest risk to them.

Fractures and dislocations in players, although of low frequency, lead to long periods of absence and represent a high level of risk to a club. Furthermore, it was identified that the majority of the fractures and dislocations were caused by the player initiating a challenge. Muscle strains and ligament sprains also have a relatively high frequency of occurrence but it is the major strains and sprains, which account for the relatively high risks associated with these injuries. The majority of muscle strains and ligament sprains were caused by football specific factors and player contact mechanisms, respectively. Over one quarter of the risk to the club and player was also associated with re-injuries. Hawkins (1997) has suggested that the frequency of re-injuries obtained in the prospective epidemiological analysis of four professional football clubs was an underestimation. Consequently, the risks may also be greater, possibly accounting for as much as one third of the risk. There are procedures available that can be introduced to ensure players' physical and physiological abilities are returned to a level that will prevent the re-occurrence of the same injury (Fuller and Hawkins, 1997).

The comprehensive risk analysis, Chapter 3, was applied to the empirical risk framework model, described in Chapter 2, to illustrate the potential consequences that theoretical player injury rates can have on the playing and financial performance of a professional football club. It was shown that the impact of injury was dependent on the club's current league position and the level of injury. Ultimately, the maximum potential of the club in terms of league position was dependent on the quality and depth of quality available within the playing squad. The application showed that due to Premier League clubs having larger squads of greater
quality and depth, they would not be seriously affected by injury until the injury rates became very high. In contrast, clubs in the First division and top half of the Second division would be most seriously affected by players' injuries because of the smaller, lower quality squads, Figure 3.20. Despite these differences, it was shown that Premier League clubs would experience greater financial consequences associated with a reduction in playing performance, Figure 3.21. This is primarily due to the greater financial rewards associated with being a Premier League club through broadcasting income and greater attendance at home matches (Boon et al, 1999). The rewards from playing in European competition were also significant to the turnover of the top Premier League clubs. Therefore, Premier League clubs have particular reason to reduce the risks of player injury given the financial rewards associated with playing performance.

By presenting the information in the appropriate format, the risk-based data were used to construct the basis of a cost benefit analysis for management investment decisions on injury prevention, treatment and rehabilitation, Chapter 5. However, before identifying the investments required by professional football clubs to reduce the risks to their players, an audit of existing services and facilities available within the clubs was carried out. The audit was designed to allow the senior physiotherapist to identify whether clubs provided the equipment, facilities and staff required to provide the optimal risk reduction environment and to identify any deficiencies in provision. With the continued growth in medical and sports science it is essential that clubs provide the best available services to manage the highly competitive and high-risk environment of English professional football.

The audit identified that in general, professional football clubs did not have adequate injury prevention support services, in terms of sports science support, to implement an appropriate risk reduction strategy. This supports the findings of Hawkins and Fuller (1998b) who showed that professional footballers have and show poor knowledge of injury prevention strategies. The existing staff levels within clubs were not sufficient to provide the best available service to players. The injury treatment, injury rehabilitation and administration demands of the physiotherapists were too high to allow them to deliver and educate players on injury prevention strategies. With many former professional players acting as club coaches and managers, Chapter 6, those individuals with the closest contact to the players have insufficient knowledge and skills to provide education on injury prevention strategies. Despite these limitations, the vast majority of clubs in the professional leagues had access to, and availability of, the facilities and techniques that were required to provide adequate injury treatment and rehabilitation for all players. It was also discovered that the level of support provision for Youth players was minimal and would leave many clubs vulnerable should any
adverse event happen during a competitive match. Although the academy system has partly resolved the issue regarding the level of medical support for Youth players (Wilkinson, 1997) there are currently just over 30 clubs registered as appropriate for the academy set up. Consequently, two thirds of clubs are unlikely to provide the recommended level of medical support provision to Youth players despite the high-risk environment of competitive football.

To ensure the deficiencies are rectified and clubs fulfil their health and safety obligations defined in the MHSW (1992) Regulations, there are two main strategies available. The deficiencies in physiotherapists' time, which are available to provide injury prevention services, can be overcome by employing additional physiotherapy support to shoulder the burden of player treatment and rehabilitation and administration. This should free the time of the senior physiotherapist to provide more injury prevention support for the players. However, a chartered physiotherapist is unlikely to have the same level of knowledge and expertise as an injury prevention specialist. Hence, it would be more desirable for the club to employ an experienced, multi-disciplined, sports scientist to support the physiotherapist and provide injury prevention support to the players. This would also provide an alternative perspective and a balanced approach to the medical support team within a professional football club.

Within industry, any new investment programme is assessed by comparing the costs associated with a loss against the costs associated with prevention (Health and Safety Executive, 1993). This process is suitable for professional football, as the vast majority of professional football clubs fail to make a pre-tax profit (Boon et al, 1999) and therefore have limited resources to allocate to the investment of new resources. This process was used to identify the injury reduction levels required to cover the costs of investing in a sports scientist, Chapter 5. The analysis was also used to identify the costs that are associated with current injury levels in professional football. In any cost benefit programme, consideration must be given to the direct and indirect costs that are associated with the investment. In the present study, the indirect costs and benefits were obtained from the risk management framework model in Chapter 2. The direct costs covered aspects such as private medical and career ending insurance policies, physiotherapy costs during injury treatment and rehabilitation, and the loss of benefit from a player’s salary due to his absence. For an average club in the Premier League, First Division, Second Division and Third Division, the annual direct injury costs were calculated to be £0.71M, £0.22M, £0.10M and £0.06M, respectively. For the whole of the English professional Premier and Football leagues, the direct costs of player injury in 1997/98 equated to £23.1M.
By using the management framework model, described in Chapter 2, the indirect costs associated with player injury reduction were also calculated. Using the injury absence rate of thirteen percent, per player, the change in team-performance and club-turnover were calculated for injury reduction levels of ten, thirty and fifty percent. These costs were summed with the direct costs to identify the injury reduction levels required to cover the investment costs of a sports scientist. The indirect analysis showed that the significant gains in team-performance were for First and Second Division clubs. The potential gains in club-turnover were substantial for Premier League clubs. The potential gains for the average Premier League club were sufficient to cover for the costs associated with investment in an injury prevention specialist. The cost benefit analysis showed that injury reduction rates, per player, of 3.9% (1.5 days), 8.5% (3.3 days), 17.2% (6.7 days), 25.4% (9.9 days) for Premier League, First, Second, and Third Division clubs, respectively, were required to cover the investment. Based on what is ‘reasonably practicable’ it would appear that only Premier League and First Division clubs could justify investing in an injury prevention specialist.

The applications of these techniques were also used in a case study of a Premier League football club, Chapter 5. Five seasons of injury epidemiological data, from 1993/94 to 1997/98, indicated that the prevailing injury absence rate, per player, was thirteen percent. The direct and indirect costs associated with player injury were calculated using the method similar to the ‘general application’ but with the club’s individual characteristics. At the time of the analysis, the case study club did not employ an injury prevention specialist. The injury reduction rate required to cover the cost investment was 4.8% (2.1 days) per player, per season. However, the calculations for the case study club were based on 24 First team players compared to a total squad (40 players) for the general application. This analysis identified the need for each club to make future investment decisions based on their injury risk and financial constraints. By adhering to the risk management process, Figure 1.1, the investment in risk reduction measures, as recommended by the cost benefit analysis should be continually reviewed and monitored. Where appropriate further hazard identification, risk estimation and risk evaluation should be utilised to ensure the risks are reduced as far as is reasonably practicable.

With the risk evaluation complete for the football clubs, the process was also applied to the players. The acute injury consequences to professional footballers in the English Leagues have previously been documented (Lewin, 1989; McGregor and Rae, 1995; Hawkins and Fuller, 1999). There is also evidence that describes the greater prevalence of osteoarthritis in former professional footballers across Europe, Table 6.1. More recently, some of the socio-economic consequences of playing professional football have been highlighted (Hicks, 1998).
Chapter 7: General Discussion

To substantiate some of this evidence in former professionals from the English Leagues, a sample of former professional footballers were surveyed on their socio-economic and medical backgrounds since retirement from playing professional football.

The high-risk environment of professional football is evident in former professionals, with nearly one half of the sample of players retiring from their chosen occupation due to chronic or acute injury. It was also evident that respondents who had retired due to injury were strongly influenced by their experiences, as measured by their perceptions of the influence that injury had on their future socio-economic status and their previous playing career. Respondents were more likely to agree with the fact that injury would have a negative influence on their future income earning potential, future medical status, duration of playing career and on their personal and their team's playing performances. In addition, the respondents were more likely to be dissatisfied with the provision of medical, sports science and welfare services, which were available to them during their playing career.

This presents immediate concerns to the PFA, which needs to ensure that players are offered an adequate compensation scheme if they retire due to acute or chronic injury. Furthermore, only a small number of players had any personal insurance cover to accommodate the consequences of their occupation. If a compensation scheme is not established, former players may attempt to obtain compensation through alternative sources, e.g. law courts. This can present a poor image of the industry. The PFA provided a high level of support to players at retirement when players requested this help. The PFA currently sponsor a medical project being co-ordinated by the FA medical research centre at Lilleshall, to establish injury patterns in the majority of English professional football clubs. Use of the data produced by the FA should provide the opportunity to introduce measures to reduce acute injuries in professional football and to reduce the potential for long-term medical consequences, which are associated with previous injury.

Just under one third of the respondents indicated that they had been medically diagnosed as arthritic, although there were indications, measured as perceptions of joint pain in daily activities, that this prevalence level may eventually be higher. This prevalence rate was much greater than has been reported for the general population (Kellgren and Lawrence, 1958; Lawrence et al, 1966; Royal College of General Practitioners, 1988). The knee joint was the site that had the greatest prevalence of osteoarthritis in respondents. Furthermore, a high number of former professionals reported that the knee was the site that led to a greater severity of pain during static and dynamic daily activities, and led to more severe injuries during their playing career. Previous injury is strongly related to the incidence of
osteoarthritis in former professional footballers (Kujala et al, 1995) and it was of no surprise therefore, that the major injury location reported for both acute and chronic injury, was the knee. This is in agreement with results reported by Hawkins and Fuller (1999) and corroborates a report on career ending injury compiled by Windsor Insurance (Windsor, 1997).

It is essential that the ruling organisations within professional football seek to address the concerns expressed by former employees about the long-term impact of injury. The recent case of Billy McPhail, who lost his case against the government for disability payments due to a medical condition, which he argued was due to his career as a professional footballer, illustrates the fragility of this issue. The Industrial Injuries Advisory Council (I.I.A.C., 1995) has yet to form any firm conclusions on the role that professional football as an occupation can play in the onset of osteoarthritis in former players. However, it is likely that stronger, prospective work will be undertaken, which may lead to professional football being answerable for the medical condition of former professionals. The potential consequences of this decision could significantly influence the image of professional football. By adopting a proactive approach for addressing the issues identified by former players, the PFA, FA, Premier and Football Leagues, and football clubs can introduce procedures to reduce the short-term and long-term risks inherent within professional football.

The studies described in Chapters 2 to 6 have provided evidence on the components of the risk management process. Additional evidence to that presented by Hawkins (1997) has been provided to support the risk estimation process and then utilised to evaluate the consequences that these risks can present through the process of risk evaluation. Evidence has been presented for the impact on the players and the clubs using a multidisciplinary approach. By using this evidence in collaboration with existing published data, the evidence can be compiled and applied to the original risk concepts that provided the framework for the thesis, Chapter 1.

7.1.3. Risk compensation in professional football: the players

The theory of risk compensation (Adams, 1995), Figure 1.2, is based on a series of postulations, which can be applied to profession football. In Figure 1.6, it was identified that there are different influences on the ‘balancing behaviour’ of the risk compensation theory within the professional football industry. This thesis has provided evidence to address the ‘balancing behaviour’ of the football clubs and their players, who are assumed to have the greatest influence on the risks inherent within the industry.
Chapter 7: General Discussion

The first component of the risk compensation model states that everybody has a propensity to take risks. By the nature of professional football being a high-risk industry (Hawkins and Fuller, 1999), and as shown in the evidence and quotes presented by Waddington et al (1999), professional footballers have a high propensity to take risks,

‘Players are so desperately keen to get back that 90% of them come back to play long before they have made a full recovery. I am no different.....’ [p. 22]

‘It was a calculated risk... they [the doctors and physios] left it to me. I knew the implications. [I had] many, many, second opinions, third opinions... I was willing to take the risk.’ [p. 31]

Chapter 6 provides further corroboratory evidence to support this point. The majority of former professionals who responded to the questionnaire indicated that they had played in a competitive match or trained whilst injured, with the use of some type of medical aid, viz. supports / strappings, modalities, medication or injections.

The model also explains that this propensity to take a risk varies from one individual to another. Hawkins and Fuller (1998b) have presented evidence that substantiates this claim through the varied opinions from professional footballers on their perceptions of injury prevention strategies. Chapter 6 also shows that there are varied opinions from former professional footballers on the influence that injury can have on their long-term socio-economic and medical status after retirement from playing. The third aspect of the model describes how the propensity to take risks is influenced by the potential rewards of risk-taking. In support of this hypothesis, Chapter 6 describes how former players who retired due to injury indicated that they would expect to receive a greater average proportion of their salary if the injury rate doubled. Waddington et al (1999) describe an example of a professional playing whilst injured to achieve his appearance bonus. As soon as the player achieved this appearance level, he remained on the injured list for the rest of the season to ensure full recovery, as described by the club physiotherapist,

‘[Player] “When I have played 35 games this season, I get a lump sum. I’m going to have these injections until I’ve played the 35 games... Can you [club physiotherapist] sort me out?” [Physiotherapist] It was a fracture of the toe, which was being numbed. Whilst he continued to play with the numbing, obviously that was delaying the union of the fracture so.... really he was retarding the healing of the bone. The bone would heal anyway, no question about that, so after he played the 35 games, he stopped playing.’ (p. 27-28)

The model goes on to postulate that the perceptions of risk are influenced by the experience of accident losses, from their own experiences and those of their peer group. Chapter 6
provides evidence to substantiate this claim because those players that retired from professional football due to chronic and acute injury, or players that had been diagnosed osteoarthritic, were more likely to agree with statements that illustrated the losses associated with a career in professional football. Hawkins and Fuller (1998b) also describe how players would not adhere to injury prevention strategies, e.g. wearing shin guards in training, because their peers would not do so.

The penultimate component of the risk thermostat model states that individual risk-taking decisions represent a balancing act in which perceptions of risk are weighed against the propensity to take a risk. A recent survey of professional footballers showed that a low perception of the risks inherent within football, which was assessed by players perceptions and experiences of injury prevention strategies, led to a high propensity to take risks (Hawkins and Fuller, 1998b). This is further illustrated in Chapter 6, where former players who had retired from playing professional football tended to indicate that they would be willing to pay more of their salary to reduce the incidence of future injuries by fifty-percent. Former players also tended to indicate that they would expect to receive an increase in their salary if their injury rate doubled. By identifying these aspects, former players are indicating that their experiences have influenced their perceptions and propensity for risk-taking towards a more risk adverse state, in contrast to their perceptions and propensity as a playing professional.

The final component of the risk compensation model states that accident loss is a result of taking risks, with the greater the risks an individual takes the greater, on average, the rewards and losses. This is supported in the example of the professional footballer described above who continued to compete to achieve an appearance bonus (Waddington et al, 1999). However, the repetitive trauma incurred whilst playing with an injury increases the likelihood of a more serious acute injury (Ekstrand and Gillquist, 1983). Furthermore, serious injuries are strong risk factors for the onset of osteoarthritis (Roos, 1998) and the socio-economic consequences (Hicks, 1998; Chapter 6). Therefore, in the long-term, it is likely that the losses will outweigh the immediate rewards sustained by playing whilst injured. However, the players’ poor perception of the long-term consequences of continuing to play with injections is not significant relative to his perception of the short-term financial rewards.

7.1.4. Risk compensation in professional football: the football clubs

The risk compensation theory can also be applied to the ‘balancing behaviour’ of the football clubs on the basis of the evidence presented in Chapters 2 to 5 and knowledge held on
professional football club’s business practices. The first and second components, which state that football clubs have a propensity to take risks, which varies among the population, is illustrated in several ways. In Chapter 4, the failure of clubs to provide adequate medical support for youth players, and the fact that many lower Division clubs do not have chartered physiotherapists providing medical support, are relevant examples of the variable propensity to take a risk. The magnitude of the direct and indirect costs, Chapters 3 and 5, substantiate the claims of a high propensity to take risks due to the high losses incurred. The level of private medical insurance and the career ending insurance taken out by clubs also demonstrates their recognition of the high risks and their propensity to transfer high risks to a third party. The employment practices of football club’s medical staff (Waddington et al, 1999) and the failure to fulfil many of their health and safety obligations (Hawkins and Fuller, 1998b; Chapter 4) also support this aspect of the risk compensation model.

The primary reason associated with a football club’s propensity to take a risk is indirectly shown through the actions of their players in response to the ‘playing whilst injured’ culture bred by club managers. Invariably the success of the club is dependent on having the best quality team available for selection, Chapter 2. When clubs fail to achieve this success, it is often the manager who is held responsible and removed from employment at the club. Therefore, the propensity to take risks is influenced by the rewards of risk-taking, which is demonstrated by the manager’s attitudes to injured players who are not available through injury (Waddington et al, 1999), as reported by one football club physiotherapist,

‘I think if a player is injured they have to work harder and longer and be inconvenienced.... [injured players] were made to “work their nuts off... so they’d rather train than be injured.” [p.24]

Although inconveniencing in this way is a disincentive for players to remain on the injured list, the procedure allows the manager to select from a higher quality squad, which has the potential of increasing success and increasing rewards, Chapters 2 and 3. There are also examples of players being cleared to play by the manager, despite the physiotherapist’s advice against this (Waddington et al, 1999). The potential rewards achievable from improved playing performance by maintaining the team-quality, have been illustrated in Chapter 2 through the risk framework model and its application in Chapter 3.

There are examples of a club’s perception of risk being influenced by the experience of accident losses. Clubs purchase expensive private medical insurance and career ending insurance to recoup the potential losses associated with player injury, Chapter 5. Many of the top Premier League clubs now also recognise that they require large, quality playing squads to
cater for injuries and suspensions associated with the demands of League, Cup and European football. Clearly the financial risk associated with poor playing performance due to injury to players could be a contributing factor, and would have a substantial effect on their turnover. This is substantiated by the risk model and its application presented in Chapters 2 and 3, as this illustrates that the greatest losses associated with poor playing performance are associated with those clubs that fail to reach European competition.

The balancing of clubs’ perceptions of risk against the propensity to take a risk is the penultimate component of the risk compensation model. Based on the evidence available it is suggested that football clubs have a low perception of the risks and a high propensity to take risks. Hawkins and Fuller (1998b), and details provided in Chapter 4, have shown that clubs are currently failing to fulfil their health and safety obligations according to the MHSW (1992) Regulations. Consequently, clubs have a low perception of the risks associated with players’ injuries. The high propensity to take risks, as illustrated by the culture within professional football (Waddington et al, 1999) and the failure of clubs to adequately support their employees, Chapter 4, corroborate this suggestion.

The final construct of the risk compensation model argues that the more risks a football club takes, the greater the rewards and losses incurred. By ensuring players are available for selection through the culture of ‘playing whilst injured’, football clubs may achieve a higher position in their respective League or an extra round of a cup competition, leading to greater financial reward. However, the ‘injured’ players are likely to be at greater long-term risk of a more severe injury, as shown by Ekstrand and Gillquist (1983). The long-term consequence may lead to greater medical costs due to further treatment and longer player absence.

7.1.5. Summary

The majority of the thesis, Chapters 2 to 5, was primarily focused on assessing the perceptions and propensity for risk with professional football clubs. Chapter 6 was predominantly designed to add to the existing literature on risks to professional footballers, evident in previous work by Hawkins and Fuller (1998b) and Waddington et al (1999). As has been illustrated with the example of the players and clubs, there is no direct method of testing the propensity to take a risk, this can be established only through indirect methods (Adams, 1995). Behaviour can be measured, but its causes can only be inferred (Adams, 1995). This concept is illustrated in professional football by the high injury frequency rate (8.5 per 1000 hours) that has been reported for professional football (Hawkins and Fuller, 1999). This injury rate is approximately 1000 times greater than other industries in the UK.
that are perceived as high-risk, e.g. construction and coal-mining (Hawkins and Fuller, 1999). It can be assumed from the example that professional footballers and their clubs are high-risk seekers, or at least that the nature of the activity is the primary factor for the high-risk environment. However, the evidence presented in the present thesis, by Hawkins and Fuller (1998b) and Waddington et al (1999) suggests that the high injury rate is due to errors in players’ and clubs’ risk perceptions and in their propensity to take risks.

It has been proposed that risk is an interactive phenomenon (Adams, 1995). Consequently, the ‘balancing behaviour’ of the football clubs has influences on the ‘balancing behaviour’ of the players. Figure 7.1 illustrates the relationship between the balancing behaviour of the football clubs and their players according to the risk compensation model. In this figure, the current ‘balancing behaviour’ within professional football is designated to be of a high propensity to take risks (X axis), a low perception of the risks (Z axis), coupled with a high difference between the potential rewards and losses (Y axis). It is assumed that the losses are greater than the rewards as indicated by the high injury frequency rates (Hawkins and Fuller, 1999) and costs associated with player injury, described in Chapter 5. The losses associated with the long-term medical and socio-economic consequences of a career playing professional football, Chapter 6, also impinge on this risk ‘state’. The ideal risk ‘state’ for professional football is the reverse of the current balancing behaviour. Therefore, the perceptions of the risks will be high, the propensity to take risks should be lower, and the difference in the rewards and losses will be higher, but in favour of the rewards. The goal of the football clubs and their players is to progress from the current risk-state to the ideal risk-state.

There are many other influences on this ideal risk-state, Figure 1.6, which implies that spectators, referees, PFA, FIFA, all have an influence to the ‘balancing behaviour’ of the football clubs and their players. The consequences that each player, club or organisation is likely to face are dependent on the decision-makers. Any rule change introduced by FIFA has little consequence to the rule makers themselves, but the consequences to the players, referees and clubs are likely to be far greater. Ultimately, to provide a consensus on the interaction between all the influences that impinge on risk within professional football, more research is required.
Figure 7.1. A three dimensional model based on the principles of risk compensation to illustrate the risk state of professional football for professional football clubs and their players.
8.1 CONCLUSIONS

8.1.1 Overview

The use of risk management concepts in the present thesis has provided evidence of the consequences that injury can have for professional football clubs and their players. The high risks associated with player injury as described by Hawkins and Fuller (1996; 1998a; 1999) in the risk estimation exercise have been shown to lead to major consequences for both football clubs and their players. These consequences are primarily of a financial nature but there are also many legal, medical, moral and ethical considerations, which need to be considered in the quantification of the short-term and long-term consequences both for players and their clubs.

In order to reduce the risks, which can lead to improvements in the football industry, it is important to identify the underlying causes of the risks faced by all concerned. By identifying these causes, appropriate interventions can be introduced to influence the underlying causes and to control the risks in the football industry. The thesis provides indirect evidence that corroborates the ‘risk compensation’ theory, suggesting that the reason for professional football being classified as a high-risk occupation is due to players’ and their club’s propensity to take risks and their poor perception of risks. The actions of players in response to the behaviour of their peers (Hawkins and Fuller, 1998b), the culture of ‘playing whilst injured’ (Waddington et al, 1999) and the failure of clubs to provide adequate specialist support, Chapter 4, are the immediate concerns to be addressed.

The impetus for change for the majority of professional clubs and their players in the English football industry is the responsibility of the Football Association. The introduction of the ‘Charter for Quality’ (Wilkinson, 1997) Youth academy set up in professional clubs is an example of one positive proactive procedure introduced by the Football Association to influence the behaviour of the new generation of professional footballers. As part of the ‘Charter for Quality’ clubs must ensure they provide sufficient medical support, but there is still ambiguity over the provision of other specialist support services. The ‘Charter for Quality’ does not specify any specific requirements for coaches other than the FA coaching qualification, or for sports science support, leaving the employment of such services as the
responsibility of each club (Wilkinson, 1997). Ultimately, the education and growth of the players within each academy will only be as good as the provision of coach, medical and other specialist support. Whilst the majority of the commitment of coaches and managers within professional football clubs remains via internal routes, drawing on former unqualified players, Chapter 6, the risk perceptions and risk propensity of the new generation of professional footballers are unlikely to change.

A further initiative introduced by the Football Association to react to the high risks associated with professional football was in response to the prospective injury audit established by Hawkins and Fuller (1999). The PFA sponsored the FA Medical Centre to establish a large-scale project with the 92 professional English clubs, monitoring all injuries throughout each playing season. The data are important to identify those risk factors, which have the most significant influence on the injuries reported by club physiotherapists. Each club that is currently involved in the project receives a detailed report at the end of each season summarising the epidemiology of injury within their club compared to a benchmark for all clubs. It is the responsibility of each club to react to this information and implement appropriate procedures to manage the risk factors. However, the majority of clubs does not have the resources available to respond to the report provided to them, Chapter 4. The outcomes from additional projects currently being run by the FA, e.g. podiatry analysis of youth players, are also restricted in the long-term by the resources provided by the football clubs.

In recognition of the growing advances in exercise and sports science and their application to professional football, the FA have sought to regulate those individuals who wish to work in this capacity within clubs. Hence, they have established a postgraduate qualification for all individuals who want to provide sports science and fitness support to professional football clubs. They also provide a continual professional development plan for all physiotherapists within clubs during the off-season and during blank international weekends (Premier League, 1998). Prior to establishing these educational programmes, there was also a complete overhaul of the coaching qualifications to bring the English system in line with UEFA. Although these changes and developments are positive indications of a change in the perceptions of the game, there are many stages of progression English football must adhere to for significant change. For example, to manage or coach professional football in England there is no stipulation on a coaching qualification, which is standard practice in many European countries, e.g. Italy, Holland. The Football Association has only recently addressed this issue. A report on the support services in Italian football also highlighted the many differences in the level of provision provided by the clubs in Serie A (Curry, 1997). This
report suggests that Italian clubs and players have a higher perception of the risks and a lower propensity to take risks in professional football.

In addition to the FA, the world governing body for football, FIFA, has an influence on the risks of injury in football. The role of FIFA in the reduction of injury is primarily concerned with the regulations that are imposed through the laws of the game. Recent changes in the law, e.g. tackling from behind, were primarily introduced to reduce the type of tackle that led to player injury. Therefore, the laws of the game constrain the actions and behaviour of the players. It is of concern because the injury frequency rates within competitive professional football are far greater in competitive matches than in training (Hawkins and Fuller, 1999). Player to player contact through tackling accounts for a significant proportion of the risk associated with injury in professional football, Chapter 3. Player to player contact was identified as the injury mechanism responsible for the majority of contusion, sprain and fracture injuries. Interestingly, the majority of fractures were to the player initiating the tackle, Chapter 3. The primary method of controlling behaviour and reducing this type of injury is through rule enforcement. However, more detail is required on the role of player behaviour and injury. Fuller and Smith are currently working in collaboration with FIFA and the F-Marc project to address this issue and to identify tackle aetiology in World Cup tournaments. This information should provide a comprehensive overview of the role that players and officials have in the causes of injury during competitive matches.

The changes in the nature of the game through FIFA and FA regulation will provide the impetus for English football clubs and their players to adopt the changes necessary for a reduction in the risks and consequences associated with playing professional football. For the players, the short-term goal is a reduction in acute injury, and the long-term consequence should lead to a reduction in long-term medical and socio-economic consequences described in Chapter 6. For football clubs, a reduction in the costs of injury and the potential influence on playing and financial performance should stabilise the business of the football club. Consequently, clubs can be more realistic in their potential achievements without compromising the financial status of the club.

8.1.2 Future recommendations

One of the major developments associated with adhering to the process of risk management is the identification of new areas of study. The present thesis is no different in this respect and has identified potential areas for research in the future. There is still a dearth of information that exists on the estimation of the risk to the FA, FIFA, officials and supporters. More
detailed work is required with specific members of the football club management team, including the coaches, team manager, academy director, chairman, financial director and board members to assess their role in the risks associated with the professional football industry. In addition to the risk estimation process, the assessment of the consequences that arise from the risks to all those described earlier requires further study. From each aspect of the thesis, the following areas for additional study have been identified.

Chapter 2: Management framework model

- The development of a quality parameter, measured as a player’s international status, provided high correlations with team-performance and club-salary. However, there are many other factors, which determine the quality of each player and the overall quality of the team. Dobson and Gerrard (1999) developed a model to determine transfer fees in the English Premier League using many other parameters including age, goals scored, previous transfer fees, full and U21 international caps. It is recommended that a more precise measure of player-quality be developed using more parameters to develop a rating for each player. In this manner, where a more definitive measure of quality can be produced, this will overcome the rating problems for clubs without international players. The new measure of quality should also overcome the limitations regarding quality of international players within a national team, experience, contribution of different playing positions and quality of support staff.

- The model was an empirical risk management framework developed to illustrate the potential that player availability can have on team-performance and club-turnover. However, to have real and practical applications in the football industry, the model needs to be economically developed and tested using case examples. It is recommended that economists adopt the ideas presented and develop the framework model into a more stringent economic model.

- It would be useful to develop similar framework models for teams in other European countries to assess if the foundations of the work are valid across other leagues.

- The clamour for a place in the English Premier League has taken on even more significance with new broadcasting contracts. However, in reality many clubs do not have the catchment area and attendance demographics to realistically compete and survive within the top Leagues. Despite this, many clubs still aspire to this goal and increase their
expenditure in the hope of reaching these echelons. Consequently, many clubs in the First Division report huge losses and face financial ruin. With additional work, the model can be used and tested to determine the potential and realistic goals for clubs in terms of performance and achievement. This may provide justification for club management investing in new players and paying high salaries when the structure around their club will never uphold the financial requirements of the Premier League. However, it is unlikely that football supporters will accept this argument.

Chapter 3: Risk of injury to professional football clubs

- One of the major findings from the re-analysis of injury frequency data revealed the influence of player behaviour on injury risk in professional football. Consequently, identifying the factors associated with injury and tackle aetiology will provide essential information for the rule regulators, i.e. FIFA, within professional football. This research has recently commenced in collaboration between Dr Colin Fuller at the Scarman Centre, University of Leicester and FIFA’s F-Marc project. The research information will also provide some indication of the influence of match officials on the health and safety of professional footballers. This work will identify aspects of tackle aetiology at certain levels of professional football but there are many other levels of football, which may influence the injury rates and need to be investigated.

- Due to the background to the research work described in this thesis, the risk analysis was presented in terms of professional football and the potential consequences for the clubs in terms of playing performance and financial turnover. However, the potential consequences for amateur footballers, who account for the majority of footballers across the world, may differ from professional footballers. Therefore, it is recommended that a similar detailed risk analysis of amateur football be completed to allow detailed risk consequences for amateur footballers to be defined in terms of medical and socio-economic consequences.

- In the context of some of the recommendations from Chapter 2, the risk analysis should also be applied to a more stringent economic model to assess its practicality within professional football.

- One of the recommendations from the risk analysis stated that with resources available for player’s health and safety limited, due to the majority of clubs failing to report a pre-
tax profit, these clubs could focus on the reduction of re-injuries. Fuller and Hawkins (1997) have suggested that a benchmarking protocol is one suitable method for intervention in reducing the re-injury rate in professional football and reducing the risk to clubs and their players. It is recommended that this procedure should be implemented in a limited number of clubs to assess the practicalities of this programme and its effectiveness in the reduction of re-injury. Once the pilot study is complete, and an effective benchmarking protocol established, it could be introduced to more clubs to reduce the influence that re-injury can have on players and their clubs.

Chapter 4: Audit of medical and support provision

- The audit results indicated that the majority of football clubs in the professional English leagues have adequate facilities available but are deficient in the provision of appropriate support staff to deliver injury prevention strategies. However, the quality of facility and current medical support provision is also likely to influence the injury risk for the players and their clubs. Therefore, more precise analyses are required on the injury treatment and rehabilitation techniques used by each club’s medical team and the influence on player absence. Although each injury and player is handled differently owing to individual circumstances, the assumption that physiotherapist qualifications and experience have an influence on injury risk needs to be tested.

- Comparisons with the support facilities provided at European clubs suggested that they were superior to those provided at English League clubs (Curry, 1997; Wilkinson, 1997). However, more precise analyses and comparisons are required involving the top European clubs to assess whether this added level of provision reduces the risk to the clubs and the players. This can be achieved through collaborative injury, facility and support provision audits. Consequently, a cost-benefit analysis can be produced to assess if the extra investment in players’ health and safety, reported in European clubs, is beneficial and cost-effective for Premier League clubs.

- To support the consensus that the implementation of injury prevention measures is effective in reducing injury risk, a controlled prospective study is required. Each intervention can be assessed through a cost-benefit analysis to justify the investment required for the proposed intervention.
Chapter 8: Conclusions and future recommendations

Chapter 5: Cost-benefit analysis of injury prevention measures

- The present study highlighted the short-term benefits associated with investment in employment of an injury prevention specialist. However, there are likely to be many long-term costs and benefits associated with this intervention procedure, which will influence the investment. It is suggested that a long-term prospective study is established to track the relative benefits to clubs, which currently employ a specialist sports scientist to condition their players. This can be compared to clubs, which rely on club coaches and physiotherapists to condition the players. This study would provide evidence to justify the benefits of a specialist sports scientist, in the short-term and long-term.

Chapter 6: The long-term impact of playing professional

- The first recommendation is for a similar large scale project to be carried out with former professionals using more detailed research techniques, i.e. interviews, to establish and support the preliminary findings highlighted in Chapter 6. A larger sample should reduce the variability in the results and permit more definitive conclusions to be made regarding the influence of specific risk factors to former players' medical conditions.

- A medical based study is required to complement the questionnaire and interview methodologies used to investigate aspects of professional footballers' playing careers. A longitudinal project, tracking the activity of players throughout their careers and after retirement from playing professional football may establish definitive evidence, which will identify the role of playing professional football in the onset of osteoarthritis. For this project to be valid, a large control group must also be tracked over a similar time period and clear standard definitions of osteoarthritis established.

- The preliminary evidence established that for players the socio-economic consequences of a career playing professional football are of concern. A separate study, focused on these aspects will more clearly define players' perceptions.

- The reduction in the prevalence of osteoarthritis should be of prime concern to football's authorities. Potential interventions, which can influence the reduction of osteoarthritis, should be tested in conjunction with a prospective medical assessment of players.
Chapter 7: General discussion

- In an attempt to explain the reasons for the high-risk environment of professional football, a risk compensation model, adapted from Adams (1995) was adopted as a framework for the thesis. The results presented in Chapters 2 to 6 were applied to this model in a descriptive manner without any attempt to test the model quantitatively. It is suggested that a study could be carried out to test the ideas behind the risk compensation theory in professional football. For this to be effective, more direct research is required on the assumptions associated with this theory. The present thesis has relied on indirect evidence to substantiate its claims.

- In testing this model, direct evidence is required from all individuals and organisations that have an influence in professional football. These individuals and organisations include players, managers, coaches, chairmen, financial directors, FA, UEFA, FIFA, PFA, supporters, and officials.

The list of recommended directions for future research is by no means exhaustive. Using risk management concepts to research health and safety in professional football will invariably lead to additional ideas and projects that arise from each individual research project.
BIBLIOGRAPHY


Bibliography


Case study physiotherapist (1999). Squad value. Personal communication.


Edwards v National Coal Board (1949) AllER, 1, 743 - 749.


Bibliography


Bibliography


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Biblio


APPENDIX ONE

Audit used to benchmark support provision at professional football clubs
Section A: GENERAL INFORMATION:

A1. Name of Football Club:

A2. Name of senior physiotherapist:

A3. Contact telephone number:

Identification of the Football Club is only required to help with our analysis of the data provided (e.g. league, location, etc.) and a contact name is only required if a need arises to clarify any points of detail in the answers given. The name of the Club will NOT be associated with specific information provided in this questionnaire.

B. How many physiotherapists are currently working at the club? _____________________________

C. For each physiotherapist indicate whether they are Full time (F) or Part time (P). Circle as appropriate.

<table>
<thead>
<tr>
<th></th>
<th>Physio 1</th>
<th>Physio 2</th>
<th>Physio 3</th>
<th>Physio 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Time / Part Time (F) (P)</td>
<td>F P</td>
<td>F P</td>
<td>F P</td>
<td>F P</td>
</tr>
<tr>
<td>Year F.A. Diploma gained</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year chartered status gained</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years with pro footballers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at present club</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scott Drawer: Loughborough University
D. Please tick the appropriate boxes for the **FACILITIES** that are available at the club (**CLUB**) or otherwise available to the club (**OTHER**).

<table>
<thead>
<tr>
<th></th>
<th>Club</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ultrasound</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Shortwave diathermy</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. T.E.N.S</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Fixed weights machines</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Free weights</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Rowing machine</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13. Stepping machine</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>15. Trampet</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>17. Spring/pulley systems</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>19. Oxygen tank</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>21. MRI scans</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>23. Others</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>a. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

E. Please tick the following **ADDITIONAL** specialist advisors are employed by the club on a **FULL TIME (F)** or **PART TIME (P)** basis.

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nutritionist</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Osteopath / Chiropractor</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Development Officer*</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Club doctor</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>a. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Fitness advisor</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Sport Psychologist</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Radiologist</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Orthopaedic surgeon</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Podiatrist / Chiropodist</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Sports masseur/euse</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c .................................</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Neurologist</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12. Biomechanist</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
F. Please tick the appropriate box for the rehabilitation **TECHNIQUES** that are available at the club (CLUB) or otherwise available to the club (OTHER). If application of the rehabilitation technique is carried out by a staff member **OTHER THAN THE CLUB PHYSIOTHERAPIST** please indicate the employee (STAFF) who is responsible for application of that technique (use the codes provided below).

<table>
<thead>
<tr>
<th>TECHNIQUES</th>
<th>Club</th>
<th>Other</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ice treatment</td>
<td></td>
<td></td>
<td>2. Electrotherapy</td>
</tr>
<tr>
<td>3. Vertebral mobilisations</td>
<td></td>
<td></td>
<td>4. Peripheral mobilisations</td>
</tr>
<tr>
<td>5. Vertebral manipulations</td>
<td></td>
<td></td>
<td>6. A.N.T techniques</td>
</tr>
<tr>
<td>7. Friction massage</td>
<td></td>
<td></td>
<td>8. Other massage</td>
</tr>
<tr>
<td>9. P.N.F techniques</td>
<td></td>
<td></td>
<td>10. Muscle Imbalance techniques</td>
</tr>
<tr>
<td>15. Functional assessment</td>
<td></td>
<td></td>
<td>16. CV conditioning / testing</td>
</tr>
<tr>
<td>17. Strength conditioning / testing</td>
<td></td>
<td></td>
<td>18. Flexibility conditioning / testing</td>
</tr>
<tr>
<td>19. Isokinetic testing</td>
<td></td>
<td></td>
<td>20. Proprioceptive training</td>
</tr>
<tr>
<td>23. Others.a.</td>
<td></td>
<td></td>
<td>23. b.</td>
</tr>
<tr>
<td>23. c.</td>
<td></td>
<td></td>
<td>23. d.</td>
</tr>
</tbody>
</table>

**STAFF MEMBER CODES**

- a. Sports Masseur / euse: M
- b. Fitness Advisor: FA
- c. Chiropodist / Podiatrist: CP
- d. Chiropractor / Osteopath: CO
- e. Orthopaedic surgeon: S
- f. Biomechanist: B
- g. Club Doctor: D
- h. Others (Use own code.)

**G.** Please list the **TECHNIQUES AND FACILITIES** that are used by your club during rehabilitation of the **LISTED INJURIES**. Indicate in brackets () after each technique, the **TOTAL NUMBER OF DAYS** that the technique is typically used by your club during rehabilitation of injuries A, B and C.

*Scott Drawer: Loughborough University*
INJURY A: *HAMSTRING MUSCLE STRAIN*, returning to play in 14 days (Grade I)
INJURY B: *ANKLE SPRAIN* to lateral ligamentous complex, returning to play in 28 days (Grade II)
INJURY C: *Total RUPTURE of ACL KNEE LIGAMENT*, requiring surgery and returning to play in 6 months (Grade III)

<table>
<thead>
<tr>
<th>INJURY A</th>
<th>INJURY B</th>
<th>INJURY C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Techniques (time)</td>
<td>Facilities</td>
<td>Techniques (time)</td>
</tr>
</tbody>
</table>

*Scott Drawer: Loughborough University*
H. **ESTIMATE** the typical cost (as an hourly rate) of provision of the following specialists used during injury rehabilitation.

<table>
<thead>
<tr>
<th>SPECIALIST ADVISORS</th>
<th>COST (£)</th>
<th>SPECIALIST ADVISORS</th>
<th>COST (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Physiotherapist (F/T)</td>
<td></td>
<td>2. Physiotherapist (P/T)</td>
<td></td>
</tr>
<tr>
<td>3. Psychologist</td>
<td></td>
<td>4. Fitness advisor</td>
<td></td>
</tr>
<tr>
<td>5. Chiropodist / Podiatrist</td>
<td></td>
<td>6. Osteopath / Chiropractor</td>
<td></td>
</tr>
<tr>
<td>7. Masseuse / Masseur</td>
<td></td>
<td>8. Club doctor</td>
<td></td>
</tr>
<tr>
<td>15. Other......................</td>
<td></td>
<td>16. Other......................</td>
<td></td>
</tr>
<tr>
<td>17. Other......................</td>
<td></td>
<td>18. Other......................</td>
<td></td>
</tr>
</tbody>
</table>

*Scott Drawer : Loughborough University*
I. Please tick the boxes for the **CLUB MEDICAL STAFF** and **ADDITIONAL SPECIALIST ADVISORS** that are available to the club (CLUB) or otherwise available to the club (OTHER) and are present during **TRAINING SESSIONS (PART 1)** and during **COMPETITIVE MATCHES (PART 2)**.

<table>
<thead>
<tr>
<th>SPECIALIST ADVISORS</th>
<th>TRAINING SESSIONS (Part 1)</th>
<th>COMPETITIVE MATCHES (Part 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st team</td>
<td>Reserve</td>
</tr>
<tr>
<td>1. Physiotherapist 1</td>
<td>Club</td>
<td>Other</td>
</tr>
<tr>
<td>2. Physiotherapist 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Physiotherapist 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Psychologist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fitness advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Chiropodist / Podiatrist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Osteopath / Chiropractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Club Doctor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Orthopaedic surgeon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Radiologist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Masseuse / Masseur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Nutritionist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td></td>
<td></td>
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<tr>
<td>b.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
J. Indicate the **ESTIMATED TIME** (In hours per week), you spend during each of the **LISTED JOB TASKS**. The football season has been split into distinct phases to accommodate for the variable distribution of injuries throughout a typical season.

a) Pre / Early season covers **JUNE** to **SEPTEMBER**
b) Mid season covers **OCTOBER** to **JANUARY**
c) End season covers **FEBRUARY** to **MAY**

<table>
<thead>
<tr>
<th>JOB TASKS</th>
<th>Pre / Early - season</th>
<th>HOURS PER WEEK</th>
<th>Mid - season</th>
<th>End - season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Administration / meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Treatment preparation time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Actual treatment time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Rehabilitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Functional assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Staff development i.e. courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Travel time (inc. hotel accommodation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Providing consultation / advice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Fitness training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Filling in questionnaires !!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Thankyou for completion of this survey.**
APPENDIX TWO

Questionnaire used to assess the long-term impact of playing professional football
THE LONG TERM IMPACT OF INJURY TO PROFESSIONAL FOOTBALLERS

Scott Drawer BSc., MSc
Colin Fuller BSc., PhD
The Impact of Injury to Professional Footballers

‘Whether competing in the world of football or commerce, it is vital to recognise the importance of Health & Safety’

Denis Law (1998) [OHS&E]

The P.F.A. is collaborating with Loughborough University to obtain information on the long-term consequences of playing professional football. This information will help evaluate and guide the P.F.A. strategy for its members in the future.

YOUR OPINIONS AND RESPONSES ARE VALUED AND ARE VITALLY IMPORTANT TO THIS PROJECT. Please take the time (approx. 20 minutes) to complete this document and return in the S.A.E. If you have further enquires please contact Scott Drawer at Loughborough University, whose details are listed below.

Best Wishes

Gordon Taylor        Scott Drawer
P.F.A               Loughborough University

Completed questionnaires should be returned to:

Centre for Hazard and Risk Management
Loughborough University
LOUGHBOROUGH
Leicestershire
LE11 3TU

Tel No:       01509 222188
Fax No:       01509 223991
Email:        S.Drawer@lboro.ac.uk
Part A: Personal Details / Football Career

1. Date of birth (day / month / year) ____________________________

2. Record your age (yrs) when each of the following events occurred.

<table>
<thead>
<tr>
<th>Age</th>
<th>First official refereed schoolboy game</th>
<th>First professional contract</th>
<th>Retirement from playing professional football</th>
</tr>
</thead>
</table>

3. List the professional football clubs played for during your career:

<table>
<thead>
<tr>
<th>Club</th>
<th>Date from (mm/yy)</th>
<th>Date to (mm/yy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please tick one box in each of questions 4, 5 and 6.

4. Highest playing level achieved

- Full International □
- Premier (Old 1st) □
- 1st (Old 2nd) □
- 2nd (Old 3rd) □
- 3rd (Old 4th) □

5. Major playing position

- Goalkeeper □
- Defender □
- Midfielder □
- Forward □

6. Dominant kicking leg

- Right □
- Left □
- Neither □
7. Indicate which of the following was the MAJOR reason for retiring from professional football. If the primary reason was injury, please state the location and injury nature, e.g. knee ligament sprain.

Acute Injury [One off major injury]

Injury location and nature

Chronic Injury [Wear and tear]

Injury location and nature

Limited physical capabilities e.g. fitness

Alternative career opportunity

Non renewal of contract at club

Other reason

Please state

8. Indicate the average frequency with which each of the following treatments were used to enable you to play or train whilst injured, using the scale:

1: Never
2: Rarely, 1-2 times / career
3: Occasionally, 1-2 times / season
4: Frequently, 3-5 times / season
5: Regularly, more than 5 times / season

<table>
<thead>
<tr>
<th>MEDICAL TREATMENT</th>
<th>Frequency of use of medical aid throughout career</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports / Strapping</td>
<td>Specialist equipment e.g. heat</td>
</tr>
<tr>
<td>Specialist equipment e.g. heat</td>
<td>Medication e.g. painkillers, anti-inflam.</td>
</tr>
<tr>
<td>Medication e.g. painkillers, anti-inflam.</td>
<td>Non steroid injection e.g. lignocaine</td>
</tr>
<tr>
<td>Non steroid injection e.g. lignocaine</td>
<td>Steroid injection e.g. cortisone</td>
</tr>
</tbody>
</table>

Training

Competition
9. Indicate how satisfied you were with the following services provided by your club/s whilst *playing* professional football.

<table>
<thead>
<tr>
<th>Support service</th>
<th>Very satisfied</th>
<th>Slightly satisfied</th>
<th>Neither satisfied / dissatisfied</th>
<th>Slightly dissatisfied</th>
<th>Very dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical e.g. physio, doctor, consultant</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Sports science e.g. fitness, nutrition</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Welfare / Education e.g. advice, financial</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

10. Please indicate if osteoarthritis has been diagnosed by a medical professional in any member of your immediate family (parents, grandparents, brothers, sisters, uncles, aunts). If you answer yes, please indicate the family member/s and their affected joint/s.

No ☐

Yes ☐ (Please complete the table below)

<table>
<thead>
<tr>
<th>Immediate family member</th>
<th>Affected joint/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
</tr>
</tbody>
</table>
Part B : Physical activity reports / Career details

11. Estimate the average number of days per week that you trained during a typical season as:

<table>
<thead>
<tr>
<th>Number of days</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) schoolboy / amateur</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>b) professional</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>c) retired pro. footballer</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

12. Indicate the estimated average number of hours per week spent in the various training types at each stage of your career.

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>Endurance</th>
<th>Power</th>
<th>Football activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>e.g. continuous running</td>
<td>e.g. weight training.</td>
<td>e.g. sprinting, jumping, practice games, drills.</td>
</tr>
<tr>
<td>Schoolboy / amateur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional footballer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retired pro footballer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. Indicate the major type of non – football leisure activity undertaken during each stage of your career. Tick one box for each stage of career.

<table>
<thead>
<tr>
<th>STAGE OF CAREER</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mainly sitting e.g. reading, educational courses</td>
</tr>
<tr>
<td></td>
<td>Light mixed walking, standing, little lifting, e.g. golf, snooker</td>
</tr>
<tr>
<td></td>
<td>Heavy mixed some bending and twisting, lifting less than 35kg, e.g. gardening, DIY</td>
</tr>
<tr>
<td></td>
<td>Heavy bending, twisting, daily lifting objects over 35kg or maximal lifts, e.g. weight training</td>
</tr>
<tr>
<td>Schoolboy / amateur footballer</td>
<td>☐</td>
</tr>
<tr>
<td>Professional footballer</td>
<td>☐</td>
</tr>
<tr>
<td>After retirement from playing professional football</td>
<td>☐</td>
</tr>
</tbody>
</table>

14. List the occupations and time spent in each occupation since retirement from playing professional football. Indicate whether the occupation was part time (P)\textsuperscript{i} or full time (F)\textsuperscript{ii}.

i): Part time - 20 hours or less per week;

ii): Full time - more than 20 hours per week.

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th>P / F</th>
<th>Date from (mm/yy)</th>
<th>Date to (mm/yy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Part C : Injury History During Your Professional Playing Career ONLY

15. Record for each listed joint the *number* of moderate\(^1\) and / or major\(^{ii}\) injuries received during *training* or whilst *playing* competitive matches. Indicate if any of these injuries have led to surgery or if arthritis has been diagnosed at the joint.

i) Moderate injuries: absent from training / competition for 1 week to 1 month

ii) Major injuries: absent from training / competition for 1 month or more

<table>
<thead>
<tr>
<th>Joint</th>
<th>Number of moderate injuries(^1)</th>
<th>Number of major injuries(^{ii})</th>
<th>Number of operations required for these injuries</th>
<th>Age at which surgery first required</th>
<th>Indicate (✓) whether arthritis has been diagnosed by a medical professional</th>
<th>Age at which arthritis first diagnosed</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. Hip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Hip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. Knee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Knee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. Ankle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Ankle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Part D: Present Day Joint Function

16. Indicate the intensity of pain experienced in the joints shown for each of the daily activities listed.

i) For the intensity of pain please use the following scale –

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nil pain</td>
</tr>
<tr>
<td>1</td>
<td>Minor pain</td>
</tr>
<tr>
<td>2</td>
<td>Moderate pain</td>
</tr>
<tr>
<td>3</td>
<td>Severe pain</td>
</tr>
<tr>
<td>4</td>
<td>Very severe pain</td>
</tr>
</tbody>
</table>

**DAILY ACTIVITIES**

<table>
<thead>
<tr>
<th>JOINT</th>
<th>During sleep</th>
<th>5 mins after getting up (am)</th>
<th>Sitting for 30 mins</th>
<th>Standing</th>
<th>Walking up / down stairs</th>
<th>Walking over 1 km</th>
<th>Squatting or bending forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g.</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>R.Hip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.Hip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.Knee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.Knee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.Ankle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.Ankle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Part E: Current opinion**

17. For each of the following statements tick the option that most closely matches your opinion.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Injuries received from <em>playing</em> professional football <em>do not limit</em> the overall length of football career</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>b. If individual players are unavailable for selection due to injury, it is <em>likely</em> to influence the <em>team</em>’s performance and success.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>c. After retirement from <em>playing</em> professional football, injuries received are <em>likely</em> to contribute to future medical problems.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>d. After retirement from <em>playing</em> professional football, injuries received are <em>unlikely</em> to reduce income-earning potential.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>e. After retirement from <em>playing</em> professional football injuries received are <em>likely</em> to limit future career opportunities.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>f. Injuries received from playing professional football are <em>unlikely</em> to affect an <em>individual</em>’s playing performance or career success.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Part F: Help received after retirement or if currently playing professional football**

Scott Drawer, Loughborough University
18. Rate each of the listed organisations / contacts in terms of their contribution or practical advice provided to you after retirement from playing professional football for the issues shown [If not applicable please indicate - n/a].

i - Rate contribution and practical advice on the following scale:
0: Nil contribution / advice
1: Slight contribution / advice
2: Minor contribution / advice
3: Moderate contribution / advice
4: Major contribution / advice

<table>
<thead>
<tr>
<th>ORGANISATION</th>
<th>Medical problems</th>
<th>Financial aid</th>
<th>Career advice</th>
<th>Educational needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football Association</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Football Association</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Football / Premier League</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former club (s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club (s) insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow players</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please state)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Part G : Willingness to reduce injury

19. Each year on average, injuries result in a squad player in a professional club missing approximately one month of the season. About 40 % of these injuries are muscle strains, 20 % are ligament sprains and 4 % are fractures. If you could reduce the level of one of these injury types by half, which ONE would you choose to reduce?

   Strains □         Sprains □         Fractures □

20. Enter the number of days, weeks or months wages per year that you would have been prepared to pay to have reduced the risk of all your injuries over your career by half.

   None □          Days wages / year .................  Weeks wages / year .................  Months wages / year .................

21. Enter the number of extra days, weeks or months wages per year that you would expect to receive to continue playing if the risk of all your injuries over your career doubled.

   None □          Days wages / year .................  Weeks wages / year .................  Months wages / year .................

Thank you for completion of this document.