ORIGINAL RESEARCH ARTICLE

A comparison of the nature and severity of injuries in younger and older professional soccer players

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Abstract

Objective. To compare the nature and severity of injuries in young and older professional soccer players in South Africa, and to determine whether the number and nature of injuries sustained increases with age.

Design. A prospective, descriptive study of 40 professional players under the age of 22 years and 40 professional players over the age of 26 years was undertaken over 2 seasons.

Setting. Medical support facilities at practices and matches, for a professional soccer team and a national junior team.

Interventions. Data on injuries were collected on a standardised form and included the anatomical site of injury, mechanism of injury, whether the injury was acute or recurrent, and the number of days absent from training or games due to injury.

Main outcome measures. Comparison of the number, nature and severity of injuries and the duration of training and playing time missed through injury in the 2 groups.

Results. Seventy-eight injuries were recorded in the younger age group compared with 123 in the older age group. The younger players sustained significantly more slight injuries (59%) that did not necessitate time off training than the older players ($p < 0.031$). Young players required on average 38.8 days to recover from each injury while the older players took only 26.4 days. The ankle was the most common site of injury. Recurrent injuries were most common in the older age group.

Conclusion. The incidence of soccer-related injuries rose with age. Most injuries were minor. Information on the nature and severity of injuries can be used to develop appropriate preventive programmes.

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Introduction

Association Football or soccer is the most popular sport in the world and has the largest active participation and following of any sport in South Africa. The International Federation of Football Associations (FIFA) includes 186 countries, with a total playing population of approximately 200 000 professional players and 240 million amateurs.[12] Professional soccer is a multimillion Rand business in South Africa, and players' livelihoods and in some cases clubs' financial viability are dependent on reducing the number and severity of injuries sustained by players.[15] There is little information available on the nature and severity of injuries to professional soccer players in South Africa.

Physiologically, soccer is classified as high intensity, intermittent exercise, with professional players running approximately 10 km per game.[12] Functional activities of the game include acceleration, deceleration, jumping, cutting, pivoting, turning, and kicking and heading the ball. When combined with tackling, players are placed at relatively high risk of sustaining both contact and non-contact injuries.[4]

When reviewing the literature on soccer injuries, 3 points emerge: disparity in reports on the effect of age on the risk of injury, lack of standardisation of the definition of injury, and the effect of prior injury as a predictor of subsequent injury.

While the majority of reports suggest that older players are more at risk of being injured than young players,[9,13,16-19,21] others report that younger players are at higher risk[6,22] or that there is no difference in the risk.[9] Focussing on studies that reported on professional players, players over the age of 26 were found to be more prone to injury[19] while younger players, 17 - 25 years of age were more likely to sustain preseason injuries than older players.[23] However, Morgan and Oberlander[20] found that age was not associated with prevalence or severity of injury during the first year of Major League Soccer in the USA.

Several studies have linked prior injury to further injury. A study of 398 players, aged 14 - 42 years, concluded that the age of the player and previous injuries influenced the occurrence of severe injuries.[4] Others have identified acute complaints as a predictor of subsequent injury.[6,14]

As with all studies on injuries in sport, standardisation of the definition of injury is important to be able to make meaningful comparisons. Some studies have used medical insur-

ance data to determine the nature and severity of injury,[12] but this is not appropriate in South Africa where many players are not covered by insurance or teams have their own medical personnel. In addition, some injuries may not hamper participation in a sport. For example, a broken finger requiring an insurance-related medical consultation may not necessarily prevent a professional footballer from playing.

The National Athletic Injury Registration System (NAIRS) in the USA defines an injury as reportable if it limits athletic participation for at least the day after the occurrence. The NAIRS differentiates between minor (1 - 7 days), moderately serious (8 - 21 days), serious (over 21 days), and permanent damage. Other researchers define the cut-off slightly differently: less than 1 week is considered minor, 1 - 4 weeks moderate, and more than 4 weeks is considered severe.[14] The Council of Europe defines an injury as that which includes one of the following: *(i)* a reduction in the amount or level of sports activity; *(ii)* a need for (medical) advice or treatment; and *(iii)* adverse social or economic effects.[12] Sporting time lost is the criterion most often used in the definition of soccer injuries, followed by medical treatment and tissue diagnosis.

It is important to determine those injuries that are more likely to occur, and to develop preventive strategies to reduce both the number and severity of such injuries. To do so requires reliable data on the type and severity of injuries sustained in the sport. No data are available for the pattern of injuries of professional soccer players of different ages in South Africa. The aim of this prospective pilot study, which investigated a group of young professionals and a group of older professionals participating in the South African professional soccer league over 2 seasons, was to determine whether increasing age increased the risk and/or nature of injury so that preventive measures can be planned and implemented.

Methods

A prospective pilot study of 80 professional players was undertaken over a period of 2 seasons, from May 2001 to June 2003. The players were divided into 2 groups. One group consisted of 40 young professional players aged 22 years or younger, who were members of the South African under-23 National Olympic Soccer Team. They were all members of various premier soccer league (PSL) and first division teams in South Africa. Those playing for overseas-based clubs were excluded from the study. The second group was made up of 40 older players aged 25 years and older who were in the squad of a PSL team. The age gap between the 2 groups of 3 years was included in the study design to diminish the chance of a beta error. Some players were transferred from the team during the study period, whilst new ones were signed on. Injury profiles of both groups were obtained from their respective team doctors. Players who left the PSL team for overseas teams were excluded from the study. One of the authors (HEN) was the team doctor for both groups.

Injuries were recorded as and when they occurred at training or during games. All players who sustained injuries were examined by a doctor or physiotherapist and information relating to the injury was recorded on a standardised report form.

For the purposes of this study an injury was defined as one sustained during training or a game, for which the player consulted the doctor or physiotherapist for medical treatment. Injuries unrelated to football were not included, nor was absence due to illness.

Severity of injury was defined as minor, moderate, or major depending on whether the player was absent from training and/or games for a period of less than 7 days, 7 - 30 days or more than 30 days, respectively. Injuries that resulted in no time lost from training and/or games were defined as 'slight' injuries.

Acute injuries were those of rapid onset. Recurrent injuries or re-injury was defined as an injury of the same nature and location involving the same player in the same season.

Permission to carry out this study was granted by managements of both the PSL club and the South African Football Association, and was approved by the Ethics Committee of the University of KwaZulu-Natal.

Statistical analysis included descriptive statistics, and unpaired *t*-tests and contingency tables using Fisher's exact tests were used when appropriate, with alpha set at 5%.

Results

The average age on entering the trial was 19.4 ± 1 years for younger players and 27.5 ± 1.7 years for older players. All 80 subjects completed injury records for the entirety of the first season and second season. Two hundred and one injuries were recorded during that period. Of these, 78 (39%) injuries or 1.95 injuries per person were in the younger age group and the remaining 123 (61%) or 3.08 injuries per person in the older age group. Older players therefore sustained approximately 50% more injuries per person on average than the younger players over the 2 years.

The injuries were then analysed in terms of the number of injuries per player over the 2 seasons (Table I). The younger players were found to have sustained fewer injuries than the older group. The difference was significant in both the first season ($p = 0.016$, relative risk 0.59), and the second season ($p < 0.0001$, relative risk 0.45). Although fewer young

TABLE I. The total number of players injured, the total number of injuries sustained and the average number of injuries per injured player for both seasons

	Season 1			Season 2		
	Players injured (*N* (%))	No. of injuries	Injuries per player (*N*)	Players injured (*N* (%))	No. of injuries	Injuries per player (*N*)
Young	20 (50)	44	2.2	17 (43)	34	2.0
Older	34 (85)	69	2.0	38 (95)	54	1.4
Total	54	113	2.1	55	88	1.6

players were injured, they sustained more injuries per player than the older players but this was not statistically significant. When slight injuries were excluded, 27 of the older players were injured over the 2 seasons while only 17 younger players were injured. This difference was significant ($p < 0.041$, relative risk 0.59).

A total of 3 092 days (442 weeks) were missed from training/games due to injury, 1 240 days (177 weeks) in the younger age group and 1 852 days (265 weeks) in the older age group over a period of 2 seasons. The young players with 78 injuries, of which 46 (59%) were slight and resulted in no time lost to training or competition, averaged 38.8 days off training per injury, while the older players averaged 26.4 days off training per injury, a difference of almost 2 weeks. When looking at the individual players injured over the 2 seasons, the average time off play or competition for the 27 older players who were injured was 68.5 ± 67.9 days (95% confidence interval (CI): 41.7 - 95.5) and for the 17 younger players, 72.9 ± 83.9 days (95% CI: 29.8 - 116.1), ($p < 0.05$).

The number of injuries sustained in the early season (the time from the completion of the league programme of 1 year to the middle of the next league programme, July - December), was not statistically different from the number sustained in late season (January - June). For both groups combined over the 2 seasons, 100 (50%) injuries were sustained in the early season and 101 (50%) in the late season.

The injuries were analysed in terms of whether they were acute or recurrent and whether they resulted from a contact or non-contact situation (Table II). Of 78 injuries sustained over the 2 seasons in the younger age group, there were significantly fewer recurrent injuries than acute injuries ($p < 0.0001$), whereas in the older players there were significantly more recurrent injuries than acute injuries ($p < 0.0001$). There was no difference between groups with respect to contact and non-contact injuries ($p = 0.423$). There were significantly more contact injuries than non-contact injuries for both groups ($p < 0.0001$).

TABLE II. The total number of injuries sustained in both groups of players over the 2 seasons, based on the nature and aetiology of the injury (*N* (%))

	Younger	Older	Total
Total number of injuries	78	123	201
Acute	50 (64)	43 (35)	93
Recurrent	28 (36)	80 (65)	108
Contact	59 (76)	86 (70)	145
Non-contact	19 (24)	37 (30)	56

TABLE III. The number of injuries sustained over the 2 seasons in the younger and older players, based on the severity of the injury (*N* (%))

	Younger	Older	Total
Slight	46 (59)	53 (43)	99 (49)
Minor	11 (14)	42 (34)	53 (26)
Moderate	12 (15)	15 (12)	27 (13)
Major	9 (12)	13 (11)	22 (11)

TABLE IV. Sites of injuries sustained in both groups of players over the 2 seasons (*N* (%))

	Young	Older	Total
Foot	3 (4)	3 (2)	6 (3)
Ankle	27 (35)	47 (38)	74 (37)
Leg	4 (5)	6 (5)	10 (5)
Knee	14 (18)	34 (24)	48 (24)
Thigh	9 (12)	7 (6)	16 (8)
Groin	17 (22)	22 (18)	39 (19)
Chest and abdomen	3 (4)	1 (1)	4 (2)
Upper limb	1 (1)	0 (0)	1 (1)
Head and neck	0 (0)	3 (2)	3 (2)

TABLE V. Diagnosis of injury in both groups over the 2 seasons (*N* (%))

	Total
Foot contusion	6 (3)
Ankle sprains	74 (37)
Achilles tendinopathy	5 (3)
Fibular fractures and shin splints	5 (3)
Knee ligament sprain	48 (24)
Quadriceps strains	4 (2)
Hamstring strains	12 (6)
Groin strains	39 (19)
Other	8 (4)

TABLE VI. Number of injuries sustained in younger and older players in seasons 1 and 2, presented as acute and recurrent injuries

	Younger			Older		
	Total	Acute	Recurrent	Total	Acute	Recurrent
Head injuries	0	0	0	3	3	0
Neck injuries	0	0	0	0	0	0
Chest injuries	1	1	0	0	0	0
Abdomen	2	2	0	1	1	0
Upper limb	1	1	0	0	0	0
Groin strains	17	3	14	22	4	18
Hamstring strains	5	5	0	7	4	3
Quadriceps strains	4	4	0	0	0	0
Knee sprains	14	11	3	34	9	25
Achilles tendinopathy	4	4	0	1	0	1
Fibular fractures	0	0	0	5	5	0
Ankle sprains	27	16	11	47	14	33
Foot contusions	3	3	0	3	3	0

The severity of the injuries is shown in Table III. The majority of the injuries (86%) were minor or slight. Younger players sustained significantly more slight injuries ($p = 0.031$), and older players more minor injuries ($p = 0.002$).

There was no difference in moderate or major injuries between groups.

Most of the injuries (young and older groups combined) were localised to the lower limb (96%), with the ankle and knee the commonest sites (61%). The anatomical location of the injuries for both groups over the 2 seasons is shown in Table IV. No significant difference was noted in the percentage of injuries sustained at each site.

The diagnoses of the injuries sustained in the 2 groups are shown in Table V. Ankle sprains accounted for most injuries, followed by knee ligament sprains and groin strains. The relationship between acute and recurrent injuries and anatomical site is shown in Table VI. Knee injuries were more likely to be acute in nature in the younger players and recurrent in the older players ($p = 0.001$), and similarly for ankle sprains ($p = 0.016$). There was no difference between acute and recurrent groin injuries in the 2 groups.

Discussion

This study set out to document the frequency and nature of injuries sustained over 2 seasons in 2 groups of players of different age. No attempt was made to relate the injuries to the total number of hours spent in training or play. A major finding in this study was the relatively low overall incidence of injury among male professional soccer players, with 68% of the players sustaining an injury during the first season, and 69% in the second season. It is also important to note that 59% of the injuries in the younger players were slight and did not necessitate time off training and/or competition compared with 43% in the older players ($p < 0.031$). The overall injury rate was low in comparison with other studies.[1,7,11,18] There were no permanent disabilities.

The results of this study show that significantly more players were injured in the older group. In the group of younger players, 50% sustained an injury in the first season and only 43% in the second season, while 85% of the older players were injured in the first season ($p = 0.016$) and 95% in the second season ($p < 0.0001$). When slight injuries are excluded, 17 young players and 27 older players sustained injuries that resulted in loss of training or playing time over the 2 seasons. There was, however, no difference in the number of injuries per injured player. This study therefore concurs with those previous studies which have found that increasing age increases the risk of injuries.[19] It should, however, be noted that the younger players played for different clubs and may have undergone different training programmes. This may have influenced the injury profile for this group.

While the younger players sustained significantly fewer injuries that required time off training and competition, they took on average almost 2 weeks longer to recover from their injuries (38.8 days) than the older players (26.4 days). It is interesting to note that based on the total number of days of injury in the 2 groups, 177 weeks of training and competition were missed by the younger players. This equates to 1.7 players or 4% of the squad being unavailable throughout a year. Similarly, 2.5 older players or 6% were always unavailable for training or competition.

The results of this study confirm findings in other studies[5,7,13] that show soccer to be a relatively safe sport in terms of incidence of injury as well as extent of athletic disability. Although there appears to be some controversy in the literature about the relationship between age and the risk of injury, the majority of studies, conducted in regular competition, in soccer tournaments and in training camps, suggest that the injury rate for male junior players increases as their age increases.[13]

It might be expected that increasing age is associated with an increased risk of injury. Previous injury has been shown to be an indicator of subsequent injury and analysis of injury sequences have shown that minor injuries are often followed by moderate or major ones.[6] Older players may therefore be more likely to be injured because of an accumulation of minor injuries. As was demonstrated in this study, the younger players had more acute injuries of their ankles and knees and the older players had more recurrent injuries of these joints. As players age, their chances of having had an acute injury to either of these joints increases, and with it the subsequent risk of recurrent injury will increase.[14] Older players may also be more likely to be injured because of degeneration of tissue with age, leading to pathology.

In other cohort studies, lower-extremity injuries represent 90% of the total number of injuries.[1,4,5,21] In this study, 96% of the injuries were of the lower limb. The most common locations of soccer injuries are the ankle, groin and the knee.[7,8,9,12] In this study, the ankle was also the most common site of injury, while hamstring strains (6%) and quadriceps strains (2%) were uncommon. Groin strains (19%) were the third most common injury after ankle and knee injuries and were similar in both groups. The incidence of these types of injuries varies considerably between studies and age and level of play appear to be important confounders.[12]

Many studies demonstrate that in youth soccer, contusions of the lower leg are the most common injuries.[12] In this study there were only 6 foot contusions (3%) and the difference in frequency between the 2 age groups was not statistically significant. This is probably because this study used young players who are professionals, whereas other studies on youths relate to lower age groups and non-professional players. Various factors such as definition or categorisation of youth and the definition of foot contusions may account for the conflicting results.

A high number of injuries were due to contact. It is not surprising since soccer is a contact sport and this finding agrees with various other studies. The muscle strains and tendinopathies were non-contact injuries and most were due to overuse and overstretching. Non-contact injuries may be attributed to overuse in training, combined with bad surface, the use of inappropriate shoes, and inadequate warm-up.

Ankle sprains occur in both contact and non-contact situations. Contact injuries were usually due to foul play caused by an opponent kicking the ankle, leading to either inversion or eversion injury. Non-contact injuries of the ankle were attributed to twisting of the ankle due to uneven surface of the pitch, use of inappropriate footwear and awkward landing from a jump.

Contrary to other studies,[4] this study showed no difference in type or number of injuries sustained in the early or late season. While there is no apparent reason for this, it may be due to the fact that the season runs for almost the whole year and that for many of the players there is no break from training. A second factor may be that there is little change in the condition of the playing surfaces in South Africa during the season when compared with European countries.

In this study, more acute injuries were reported in the younger players (64%), with significantly more acute ankle ($p = 0.016$) and knee injuries ($p = 0.001$). Older players suffer from significantly more recurrent injuries (65%) than the younger players. This could be explained by the fact that older players have had various minor knocks or injuries before. It may also be that in the older players an acute re-injury of a previous injured muscle or joint has been classified as a recurrent injury rather than an acute injury. Another possibility is that the older players, with more experience, are more adept at avoiding acute injury situations.

Minor injuries have been found to be a risk factor for future injuries.[6,14] A comparison of uninjured and injured players revealed 17 risk factors of high predictive value. These risk factors could be divided into particular entities such as medical history (previous injuries and acute complaints), adequacy of warm-up, and physical overload during training and games. Previous injuries and inadequate rehabilitation are the most important and well-established intrinsic risk factors for future foot injury.[6] In this respect, data in this study tend to confirm the result of previous studies, in that the older players had significantly more recurrent injuries that the younger players. Persistent symptoms may not only be an indicator of inadequate rehabilitation, but also a precursor of future injury, or a sign of overuse or of a minor injury.

Most injuries in this study (76%), were slight or minor. This is in agreement with the findings of many other studies.[1,7,11,18] This finding further confirms that most injuries occurring in professional soccer are not severe or life-threatening. It is interesting to note that within this group of slight and minor injuries, the older players sustained a higher percentage of more severe minor injuries, while the younger players were more likely to have slight injuries that did not result in time off training or competition.

Numerous authors have described risk factors for soccer injuries and discovered possibilities for prevention. These include warm-up with more emphasis on stretching, regular cool-down, adequate rehabilitation with sufficient recovery time, proprioceptive training, protective equipment, good playing field conditions and adherence to the existing rules.[2,5,9,15] However, only a few authors have reported results of prevention interventions in soccer players.[3,10,15,22]

Conclusions

The results of this pilot study show that older professional soccer players in South Africa are significantly more likely to sustain an injury than younger players. The younger players, who sustained more slight injuries, were more likely to sustain more injuries per player than the older players. In addition the younger players took on average 2 weeks longer to recuperate from their injuries. The fact that older players tended to have more injuries resulted in a greater total time lost to training and competition.

It is becoming increasingly important to document the injuries and treatment of professional footballers. Not only does this provide a profile on each player, but it gives the club an indication of players' strength and weakness. From a budgetary point of view it gives an indication as to how many players a team must have to cover for injuries throughout the season. Records are also important for future references.

To obtain more detailed information of incidence (including exposure factor), injury mechanisms, and the relation between injuries and training, more prospective studies are needed. The information gained in this pilot study on the pattern and severity of injuries over 2 seasons will allow the authors to investigate the development of possible preventive programmes to reduce the number and severity of injuries in both young and older professional soccer players in South Africa.

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