Chapter - II

REVIEW OF RELATED LITERATURE

A careful review and exploration of the Literature related to the present study was essential to have insight into the research already carried out in this field. To provide the background material for the study, the scholar had made an attempt to go through the related literature, brief reviews of which are presented in this Chapter.

Eric¹ conduct a study to investigate rates of concussion (Brain Injury) and selected factors related to its occurrence in American Football Players. A prospective epidemiological study followed a national sample of high school and college players for two seasons. There were a total of 14,997 player- seasons, over 1 million Athlete- exposures to the possibility of injury, and 595 concussions recorded. The concussion rate for high school players is 0.56 concussions per 1000 Athlete- exposures, for college players 0.58 per 1000 athlete- exposures, and 0.57 overall. Concussion is the second (high school) or third (college) most frequent injury, is 9-10 times more likely to occur in games than in practices, and over half are the result of

helmet to helmet contact. This large prospective cohort study indicates the risk of sustaining a cerebral concussion is nearly six times greater for individuals with a history of previous concussion than for individuals with no such history.

Zemper\(^2\) collected data during four seasons (1987-1990) from a representative stratified national sample of college football teams to assess the ability of preventive knee braces to reduce the number and severity of knee injuries, specifically medial collateral ligament (MCL) injuries. There were 95 team-seasons covered, with a total of 9557 player-seasons accumulating 737,041 exposures to the possibility of being injured in a game or practice. All players on each team were a part of the study, and 2176 players on each team were a part of the study, and 2176 players (22.77\%) wore braces. Analyses of the data indicate that the number of MCL injuries in braced players was significantly higher. When analyzed by severity of MCL injury (grade, days lost or surgical injury), there were no significant differences between braced and unbraced players. When game injuries were isolated to control for the "intensity" of exposure to the possibility of being

injured, the analyses again showed no demonstrable ability of the braces to prevent or reduce the severity of MCL injuries.

E Giza, Farrell\(^3\) conducted study first two seasons of the Women's United Soccer Association (WUSA) were analyzed to determine the injury incidence, anatomic location of injuries, and relation of player position. A total of 173 injuries occurred in 110 players with an overall injury incidence rate of 1.93 injuries per 1000 player hours. The incidence of injury during practice and games was 1.17 and 12.63 per 1000 player hours, respectively. Of injuries 82% were acute and 16% were chronic. Most of the injuries (60%) were located in the lower extremities. Strains (30.7%), Sprains (19.1%), Contusions (16.2%), and Fractures (11.6%) were the most common diagnoses and the knee (31.8%) and head (10.9%) were the most common sites of injury. Anterior cruciate ligament (ACL) injuries accounted for 4.6% of all injuries and the incidence of ACL tears was 0.09 per 1000 player hours (Practice 0.04, Game 0.90), midfielders suffered the most injuries (P<0.007). The injury incidence in the WUSA in lower than the 6.2 injuries per 1000 player hours found in the corresponding male professional league (Major

\(^3\) E. Giza & Farrell, "Injuries in Women's Professional Soccer" Central Maine Orthopaedics, USA.
League Soccer); however, knee injuries predominate even in these elite
Female Athletes.

Olsen et. al.\textsuperscript{4} reported a very low incidence of severe injuries. They
attributed this to the playing conditions, dry weather, and strict refereeing. It
is possible that the more severe forms of injuries and most of the minor ones
are dealt with on the sport by the field staff. It is also possible that many
athletes with minor injuries make their way to other health centre in the area.
The sports related injuries formed 8.36\% of accident and emergency
attendances. This is higher than reported by other authors. Their reports
included female participants, who comprised approximately 25\% of injures
athletes. Whether the consideration of sex has an influence on the higher
incidence would not be ascertained.

Smith\textsuperscript{5} recently conducted a study on "Footballer's Ankle" which is a
soccer injury. He suggested that the injury occurred because in soccer the
kicking foot held in full equinus scansing stain on the anterior capsule leading
to the development of an osteophyte on the anterior tibia. Although an
osteophyte suggests osteoarthrosis, the reminder of the particular surface was

normal. Smith reminds that in soccer the average kicking velocity is 96 km. h-1 and that during a match player may kick on 60-120 occasions. In a recent prospective study of this injury from Amsterdam, there were 62 patients of which 24 were soccer players. Although most professional footballers can return to play in 6 weeks after arthroscopic surgery and the short term results are good, the long term outcome is not known. The osteophyte can occur in other sports and is a more recent paper from Seattle anterior tibial spurs were described in American football players, basketball players and ballet dancers. Soccer is also closely associated with the tibial diaphysial fractures known as "Footballers Fracture". One hundred consecutive adult Soccer players with a tibial diaphyseal fracture attending Heicester royal infirmary in England were followed prospectively. Details of the circumstances and the mechanism of injury were collected and these patience was followed up long term. Only five patients had simple spiral fractures caused by pure torsion and remainder (95%) reported as an impact as the mechanism of the injury mostly (56.5%) resulting from a kick on the shin from in front. These were caused by impact during a tackle and reflect the nature of the game and not necessarily foul play. Protective equipment is important in preventing injury but an interesting finding was that 85% of the
players were wearing the appropriate shinguards. The shinguards were
damaged by the impact in 17% of cases. The FIFA rules state that
shinguards should be worn during club games. Of those not wearing
shinguards only one had disregarded the regulations, and all the others were
playing casual games or training suggesting good compliance with the
regulations.

Kroner et al.\(^6\) reported in one year period from January 1986 to
December 1986, 4303 patients with sport injuries were treated at Aarhus
amtssygchus and Aarhus Kommunehospital. The mean age was 21.6 years
(range 7.72 years) and 2830 were men. Two hundred and seventeen
badminton injuries occurred in 208 patients (136) men with a mean average
of 29.6 years (range 7-57 years), constituting 4.1 % of all sports injuries in
joints and ligaments were injured in 58.5% patients, most frequently locate
in the lower limb and significantly more often among patients younger than
30 years of age. Muscle injury occurred in 19.8% of the patients. This type
of injury was significantly more frequent among patients older than 30 years
of age. Most of the injuries were minor. However 6.8% of the patients were
hospitalized and 30 .9% viewed additional treatments by a physician. As the

risk of the injury varies with the age, attempts to plan Training individually and to Institute Prophylactic measure should be made.

Watson\textsuperscript{7} conducted a study to investigate possible relationship between the incidence of sports injuries and the existence of body mechanics defects in players of various codes of football. Injuries were recorded prospectively over a 24 months period. Fifteen aspects of body mechanics were evaluated at the start of the study using a specially developed photogram metric technique known to have high reliability and sensitivity. It was found that subjects who suffered from ankle injuries had lower means scores for ankle mechanics than the non-injured players. Knee injury were found to be associated with the lumber lordosis and sway back. Subjects who suffered from muscle strains had a higher incidence of lumbar lordosis, sway and abnormal knee inter-space. Back injuries were associated with poor shoulder symmetry, scapulae abduction, back assymmetry, Kyphosis, lordosis and scoliosis. Subjects who suffered from two or more injuries had lower overall body mechanics scores than the other subjects. In general, it was found that the incidence of ankle, back, knee and muscle injuries was influenced by the presents of defects of body mechanics. These results

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suggest that intervention to improve body mechanics would be likely to reduce the incidence of sports injuries in soccer.

Albright and Powell\textsuperscript{8} studies a 3 year investigation of medical collateral ligament sprains of the knee to assess the effectiveness of prophylactic knee braces in NCAA Division I college football players. Position, string, type of session and daily brace wear were recorded. The injury rates for brace and unbraced knees were used to create an incidence density ratio. The data were stratified and simultaneously controlled for position, string and session and evaluated for their statistical significance. The 987 big ten player's generated 155,772 knee exposures over the study period (50% braced). Noticeable differences existed in the rates of injury for the braced and unbraced knees in almost every position during practices, depending on player or non-player status. When the influential factors of position, string and session are considered, there is a consistent but not statistically significant tendency for the players wearing preventive knee braces to experience a lower injury rate than for their unbraced counterparts. For starters and substitutes in the line positions as well as the line backers and tight ends, there was consistent trend toward a lower injury rate in both

practices and games. The braced players in the skill position (Back/Kickers), at least during games, exhibited a higher injury rate.

Warren et. al\(^9\) conducted a study to assess the relationship of personality, anatomical variables and achievement motivation to injury conditions in professional soccer player. Fourteen professional soccer players were participants in this study. Data were collected on each player for demographic variables, Anatomical Measures, Flexibility Measures, Achievement Motivation Goals and Personality Variables. All inter class correlation analyzed using person correlations. Results indicated the following relationships: high positive correlations existed between injury occurrence with active hamstring flexibility on the right side, as all the left and right sides of measures of flexibility except for moderate correlations an measures of plantar dorsi flexion when the knee was extended. Moderate positive correlations existed between following variables, personality with how much one weight trained per week, age with anxiety and year of participation with anxiety. The results suggest that greater active hamstring flexibility may indicate a tendency for injury occurrence. The players who tend to be a more type of personality weight train less, but in general spend

more days per week practicing. Level of anxiety is reduced as age and number of years of participation increase. However, level of anxiety seems to increase the greater the age of the player. The players who are more tasks oriented appear to practice more hours per week.

Reider\textsuperscript{10} designed a study to provide 5 year follow-up of the treatment of isolated Grade-III sprains of medical collateral ligament with early functional rehabilitation in 35 athletes. After injury, patients were placed in lateral hinged braces to provide valgus support without restricting flexion or extension of the knee. Treatments were initiated with range of motion exercises performed in a whirlpool or Swimming Pool. Patients were then started on quadriceps setting and leg rises. When 90° of flexion were present, resistive exercises were added. Upon recover, patients were allowed to return to unrestricted sports. Follow up consisted of both questionnaires and physical examination and was graded on 50 point hospital for special surgery scale. Mean follow up was 5.3 years (range 2.5 to 8); mean hospital for special surgery knee rating score was 45.9 points (range, 41 to 50). These results are comparable with those achieved with surgery or immobilization by earlier investigators. This, early functional rehabilitation treatment of

complete medical collateral ligament sprains produces results comparable with those achieved with surgery or immobilization while minimizing treatment related morbidity and allowing more rapid to sports participation.

Orchard\textsuperscript{11} conducted the study to measure the rate of recurrence of hamstring injury in the Australian football league (A.F.I.). Hamstring injuries from the AFI injury database that cause at least one match to be missed during the 1994-1996 seasons were analyzed. A recurrence was defined as a further Hamstring injury to that leg in the same season, which caused subsequent matches to be missed after the player had originally returned to play at least one match. There were 318 Hamstring injuries sustained over the study period, which consisted of 31365 player’s matches. The risk of a player injuring a hamstring in a given match was therefore 1%. The median number of matches (Weeks) missed from the initial was 2 (range 1-9). Players returning from a hamstring injury were at significantly increased risk of reinjuring the same hamstring during the first three weeks back from injury.

In the first week (match) back, the risk of reinjury was 9.2\% (6.0-14.1, 1.95\% c.l.). During the second and third matches back, the risk was 4.0

per match (1.8-85 95% C.l) players had a slightly higher than 1 % of risk re-injuring the hamstring in each match for the reminder of the season, but this increase was not statistically significant. The cumulative risk of recurrence, after return from injury, for the reminder the season was 23%. There was no difference in recurrence rates for those injuries originally missing only one week. The result suggest that some hamstring injuries had not fully recovered at the time that players were declared fit to return. This probably was during was the remodeling phase of healing after the re-pain phase had been completed. However as the majority of players were able to return successfully and because recurrence did not have serious consequences. The returns to play criteria used by team were not overly aggressive.

Horodyski\textsuperscript{12} high school football is a major contributor to sports injuries in adolescence. Recent investigations in football injuries at the collegiate level have indicated a higher injury rate in the spring season. The purpose of this 3 year prospective study was to determine if a similar trend existed in a high school population. Data was collected by certified athletic trainers at 13 high schools from 1994 through 1997. There were 102,237 Athlete Exposures (AE) during the fall seasons and 24,550 AE during the

spring seasons. A total of 887 injuries were incurred by 710 players. The overall injury rates for the fall and spring seasons were 7.07/1000 AE respectively. Chi-square analysis revealed no significant difference (P>.01) between fall and spring injury rates. Injuries were categorized by seventy (Mild, Moderate, Severe) with no significant differences being noted between the seasons. A significantly greater incidence of injury (P<.01) to the upper extremity was noted in the spring season. Additionally, a significant difference (P<.01) in incidence of contusions and fractures was noted. This, although the overall injury rates were not significantly different, differences noted between extremities and injury nature warrants further investigations.

Schmitt et.al.\textsuperscript{13} conducted a study on all injuries occurring over a 7 week period at a local indoor soccer arena were documented for analysis of incidence rates. All injury rates were calculated per 100 players-hours. The overall injury rates for male and female players were similar, 5.04 and 5.03 respectively. The lowest injury rate was found among the 19 to 24 year old athletes and the highest injury rate was found among the Best age group (>25 years). Collision with another player was the most common activity at

the time of injury, accounting for 31% of all injuries. The most common injury types were sprains and muscular contusions, both occurring at a rate of 1.1 injuries per 100 player-hours. Male players suffered a significantly higher rate of ankle ligament injuries compared with female players (1.24 versus 0.43, p > 0.05), while female players suffered a significantly higher rate of knee ligament injuries (0.87 versus 0.29, P < 0.01). Goalkeepers had injury rates (4.2) similar to players in non Goalkeeper positions (4.5).

Moul, Utter and Harrison\(^\text{14}\) conducted a study on sport camps are a popular activity for adolescent athletes. However, very little data exists on the injury rate occurring during in these programmes. J L. moul investigated to provide a descriptive analysis of injuries occurring during a summer sport camps programme conducted at a division I institution. An injury report was developed and utilized to record injuries occurring at a result of participating in the 1995, 1996 and 1997 programmes. A total of 2680 athletes (x age = 15.2 years) participated in 22 sport camps. Fifty three percent athletes had high school varsity experience, 40% were Junior Varsity Players. During this time 735 athletes (5.7%) occurred an injury. Females accounted for a 3.6% of the injuries and males for 56.4%. The most frequent injured body

part was the ankle (28.02%) followed by the knee (24.76%), shoulder (18.78%) and wrist (17.96%). Thirty two percent injuries were sprains and 19.3% contusions. The remaining 25.6% were categorized as fractures, skin wounds, illness or others. Ninety two percent of the injuries were acute; 14.5% required referral to the emergency room for further evaluation. During game situations resulted in 90% of the injuries with 5.5% occurring during drills and 4.5% resulting from non-sport related activities. Wrestling conducted for 40.4% of the injuries, cheerleading 17.4% and Women's Basketball 17.10%. The results of this investigation have found that injuries do occur in youth sport camps but suggest that the percentage of participants involved is relatively small.

Hawkins and fuller\(^\text{15}\) completed a questionnaire on players from five English professional football clubs. Containing 52 items relating to injury prevention practices and advice received on these issues. Responses were received from 55 players, which represents a mean response of 11 (4) and response rate of 38(14%), from each club. The main deficiencies in awareness of injury prevention strategies for players were identifies as: use of shin pads, during training and after matches, cool downs after training and

matches, and flexibility work. These deficiencies indicate a need for wider education of player in current injury prevention strategies.

Kannus\(^{16}\) conducted a study to learn the long term effects of non-operatively treated sprains of the lateral compartment of the knee joint, generally known to be relatively rare injuries. A multidimensional follow-up analysis was performed on an average 8 years after the injury in 11 patients with Grade -II sprains and in 12 patients with Grade-III sprains, including four standardized knee scoring scales for subjective, objective functional and radiographic evaluation, as well as Iso-kinetic and isometric strength evaluators. The result of grade-II sprains of the Lateral Ligament Treatment (LAT) was generally good, although residual lateral laxity was common. In Grade-III sprains, the results were much worse, with a high frequency of persisting severe of gross lateral laxity, insufficiency of the ACL, muscle weakness and post traumatic osteo arthritis of the injured knee. Grade-II sprains of the LAT respond successfully to non-operative treatment, in Grade-III sprains, however, such treatment cannot be recommended as a method of choice.

Winkelstien and Myers\textsuperscript{17} conducted a study on the biomechanics of cervical spine injury and implications for injury prevention. In this study most catastrophic cervical spinal injuries occurs as a result of head impacts in which the head stops and the neck is forced to stop the moving torso. In these situations the neck is sufficiently fragile that injuries have been reported at velocities as low as $3:1\text{m/s}$ with only a fraction of the mass of the torso loading the cervical spine – cervical injury occurs in less than 20ms. Following head impact, explaining the absence of an relationship between clinically reported head motions and the cervical spinal injury mechanism. In contrast, the forces acting on the spine at the time of injury are able to explain the injury mechanism and form a rational basis for classification of vertebral fractures and dislocations. Fortunately, most head impacts do not result in cervical spine injuries. Analysis of the biomechanical and clinical literature shows that the flexibility of the cervical frequently allows the head and neck to flex or extend out the path of the torso and escape injury. Accordingly, constrains which restrict the motion of the neck can increase the risk for cervical spine injury. These observations serve as a foundation

on which injury prevention strategies, including coaching, helmets, and padding, may be evaluated.

Back et al.\textsuperscript{18} conducted a study on sports injuries in school aged children living in Holland. A total of 7,468 pupils, aged 8 to 17, completed questionnaire covering a retrospective period of 6 week. Seven hundred ninety-one sports injuries were registered, amounting to an incidence of 10.6 sports injuries to 100 participants. In 31\% of the cases, medical consultation was needed. Injuries incurred during the study period caused 36\% of the children to miss one or more physical education classes and caused 60\% to miss school for at least 1 day contusions and sprains were the most common lesions (77\%). Three of four injuries involved the lower extremity, in particular the ankle. Sixty two percent of all the injuries occurred on organized sports; 21\% in physical education classes, and 17\% in unsupervised sports activities. The highest injury rates were found in Basketball and the Hockey. In this study population, 15 and 16 year old boys who had a high sports activity index and played team ports, particularly contact team sports, formed a high risk group.

Ross and Swain\textsuperscript{19} investigated an acute traumatic quadriplegic in a college football player and found that transverse myelitis is a rare neurological disorder. It is an interruption: symptoms develop rapidly and consists of ascending paralysis, diminished or absent sensation below the cervical of thoracic region, and often urinary retention. Etiologies include Para infections events, multiple sclerosis, autoimmune disorders, vascular insufficiency paraneoplastic myelopathy. Postvaecicial events, idiopathic occurrence, and minimal trauma. Treatment generally consists of supportive measures, the use of steroids of Hasten recovery remains controversial but is routine in most cases. The time period and degree of recovery is variable. We present a case of rapid onset of neurological symptoms in college football player right before a game. No other related cases have been reported in the sports medicine literature.

Chomiak et al.\textsuperscript{20} conduct this prospective study were to analyzed factors related to the occurrence of severe football injuries in players of different ages (14 to 42 years) and different skill levels (local teams to first league teams). In the Czech Republic 398 players were followed up for 1

\textsuperscript{20} Jiri Chomiak, and Astrid Junge, et. al., "Severe Injuries in Football Players., MD Spine Unit. Schultess Clinic Zurich, Switzerland.
year. During which time they sustained 686 injuries. Of these 113 (16.5%) were severe injuries. Ninety-seven severe injuries (86%) were able to be documented in detail. Trauma was the cause of 81.5% of the injuries and overuse was the cause of 18.5% joint sprains predominated (30%), followed by fractures (16%) muscle strains (15%) ligament ruptures (12%) meniscal tears and contusion; (8%) and other injuries. Injuries to the knee were most prevalent (29%) followed by injuries to the ankle (19%) and spine (9%). More injuries occurred during games (59%) than in practice. Twenty-four percent of the injured players had suffered a previous injury of the same body part. Forty-six percent of injuries were caused by contact and 54% involved no body contact. Thirty-one percent of severe injuries were caused by foul play. From these results and the analysis of injuries in specific body parts the following factors were determined to influence the occurrence of severe injuries: 1) personal factors (intrinsic): age of player. Previous injuries. Joint instability abnormality of the spine poor physical condition poor football skills or inadequate treatment and rehabilitation of injuries: 2) environmental factors (extrinsic): subjective exercise overload during practices and games, amount and quality to training. Playing field
conditions. Equipment (wearing of shin guards and taping) and violations of existing rules (foul play).

Seil et al.\textsuperscript{21} performed a prospective study of European handball injuries in 186 men and found that injury incidence during competition was 24 times greater than in practice. An injury was defined as any incident that resulted in absence from at least one practice or game. Over half (54\%) of all injuries occurred in the lower extremity, and the knee was the most commonly injured anatomical region.

Prager et al.\textsuperscript{22} found a greater injury risk during games than in practice. Some 53\% of all injuries occurred in games and scrimmages, and another 28\% occurred in contact drills. In this study, an injury was defined as an incident that resulted in a loss of at least 48 hours of participation time. Some 59\% of injuries occurred in the lower extremity, with the knee, ankle, and thigh being the most common injury sites.


Nielsen and Yde\textsuperscript{23} found that 60.5\% of injuries were sustained in games compared with practice in a study of 123 male Danish soccer players. An injury was defined as an incident that caused a player to miss at least one day of participation. Some 84\% of all injuries occurred in the lower extremity, with the ankle being the most commonly injured body part.

Soderman et al\textsuperscript{24}, conduct a study of lower extremity injury in 146 female soccer players, found an increased incidence (incidence rate (IR) = 10.0/1000 hours) of traumatic injury – for example, ligament sprains, contusions, and muscle strains – during games compared with practice (IR = 1.3/1000 hours). An injury was defined as an incident that caused absence from sport for at least one practice or game. The most common injuries were ankle sprains, hamstring strains, shin splints, knee contusions, Achilles tendonitis, and anterior knee pain.

Myklebust et al\textsuperscript{25} performed a prospective cohort study of anterior cruciate ligament (ACL) injuries incidence during competition was 30 times


greater than in practice. All ACL injuries were tears requiring surgical reconstruction and were verified through arthroscopic visualization.

Powell\textsuperscript{26} conducts a study on National Football League athletes between 1980 and 1985, and found that playing on artificial turf increased the incidence of knee and foot/ankle injuries. Tartan Turf had the highest injury incidence rate (IR = 2.36) followed by Super Turf (IR = 2.34) and Astro Turf (IR = 1.94) compared with grass (IR = 1.78).

Orchard\textsuperscript{27} reported that an injury sustained within the last eight weeks increased the risk of sustaining a muscle strain to the same location for the hamstrings (RR = 6.33), quadriceps (RR = 15.61), and calf muscles (RR = 8.94). Likewise, injuries sustained outside of an eight week time interval resulted in an increased risk of sustaining muscle strains at the same location for the hamstrings (RR = 2.42), quadriceps (RR = 3.67), and calf (RR = 4.28).

\textsuperscript{26} J.W. Powell, "Incidence of injury associated with playing surfaces in the national football league" \textit{Athletic Training} 1987; 22: 202-6.

Jones et al\textsuperscript{28} found low and high BMI and high body fat content for men, and shorter height for women to be risk factors for sustaining lower extremity injury among military recruits. Men in the lowest and highest quartiles for BMI had a three-fold increase in the incidence of all lower extremity injuries compared with the middle twice the incidence of injury compared with the remaining 75\% of men. Women in the lowest quartile for height were nearly twice as likely to sustain lower extremity injury as the remaining 75\% of men. Women in the lowest quartile for height were nearly twice as likely to sustain lower extremity injury as the remaining 75\% of female recruits.

Krivickas and Feinberg\textsuperscript{29} introduced a new scale for assessing muscle tightness of hip flexors, hamstrings, quadriceps, and gastrocnemidi applied it in a prospective study of lower extremity injury among collegiate athletes. No relation between muscle tightness and injury was found for women; however, for men, there was a significant relation between increased muscle tightness and incidence of lower extremity injury in

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general and, more specifically, between increased iliopsoas tightness and overuse knee injury.

Souryal and Freeman\(^\text{30}\) investigated the association between notch width and ACL injury in 902 high school athletes involved in all sports. A Notch Width Index (NWI) was calculated by dividing the width of the intercondylar notch by the width of the distal femur at the level of the popliteal groove, based on radiographic measure. Twenty ACL injuries were incurred, 14 of which resulted from non-contact mechanism and six from contact. Girls who suffered non-contact ACL injuries had significantly decreased intercondylar width ratios (NWI = 0.165) compared with all girls as a group (NWI = 0.214) compared with all boys as a group [NWI = 0.239 (0.040)]. There was no significant difference in NWI between athletes who suffered contact ACL injuries and uninjured athletes.

Surve et al.\(^\text{31}\) studied the effect of bracing on the occurrence of ankle sprains in 504 male soccer players and found that, in athletes with a history of injury, the unbraced control group sustain more ankle injuries (1.16/1000 playing hours) then the group wearing ankle braces (0.46/1000 playing


hours). There was, however, no difference in incidence of ankle sprain in athletes without previous injury between the unbraced control group and the braced group.

Backous et al\textsuperscript{32} study on the youth aged 6-17 years participating in a summer soccer camp, reported that injury risk doubled after the age of 14. Some 71\% of all injuries were sustained in the lower extremity; the ankle was the most commonly injured anatomical site in both boys and girls, and quadriceps strains were most common in boys.

Lindenfeld et al.\textsuperscript{33} study on injury incidence among indoor soccer players, reported that men older than 25 years suffered the highest rate of all injuries considered as a group (IR = 7.9) compared with males in the age range 19-24 years (IR = 3.8), 16-18 years (IR = 4.9), 12-15 years (IR = 4.4), and younger than 12 years (IR = 2.8). For females, the highest rate of all injuries was in the 12-15 years age range (IR = 6.3), compared with those less than 12 years (IR = 5.6), and those in the age range 16-18 years (IR = 4.6), 19-24 years (IR = 4.9), and older than 25 years (IR = 5.1), an injury was defined as any incident that caused a player to leave a game, required a

stoppage in play by the referee or player, or resulted in the player requesting medical attention. The body parts most often injured were the ankle and knee.

Ekstrand et al.\textsuperscript{34} conduct a study on 180 male soccer players, found a significantly greater injury incidence during match (two third of traumatic injuries) than practices (one third of traumatic injuries). An injury was defined as an incident that caused the players to miss the following practices or game and 88% of all injuries in the lower extremity.

Chomiak et al.\textsuperscript{35} reported that inadequate rehabilitation was a risk factor for sever injury among male soccer players. Nearly one quarter (n=23, 24%) of the 97 players who sustained injury had previously injured the same body part, seven of whom had done so with in the past three months, a major injury was subsequently sustained with in two months, 13 (10.055) of which were of the same type and location. J. Chomiak categorized the on the basis of duration of absence from practice; a minor injury resulted in absence from practice for less than one week, whereas a major injury resulted in absence from practices for more than one month.
