

28. SPORT INJURIES AND PREVENTION

P-046 Visual enriched presentation of football related injuries

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OBJECTIVE In the recent years, both, professional and amateur football became high physical performance demanding and battling sports, causing different sorts of injury. Football injuries vary enormously in nature, mechanism and prognosis. Being good acknowledged about injuries may help for their evaluation and to decrease injury rates, diagnostic pitfalls, financial loss and to develop treatment strategies. The aim of the present work was to evoke interest in and to briefly inform about football injuries by showing a set of football injuries presented with high quality informative photographic material.

METHODS The presented material was collected in 12 years from a series of injuries occurred in different times, with different mechanisms and at different levels of the game. 14 injuries were presented. The graphics were either owned by the authors or copied from public media. The medical content was reviewed from main textbooks, which contained classically accepted general information about such medical cases.

RESULTS A total of 14 injuries and their prognosis were presented. Two of the injuries were career ending. The rest of the presented cases recovered in a time span of 0,5-12 months totally and fully return to football was achieved.

DISCUSSION The very broad spectrum of football related injuries require a good expertise and experience of related person. Not only the physicians but also everybody involved, need to be familiar with injury situations and cases.

CONCLUSION Most of the football injuries result in total recovery, but none of them are negligible and one must keep in mind that any football injury can be career ending or life threatening.

KEY WORDS Football, soccer, injury, radiology, injury mechanism

P-047 Creatine kinase and testosterone cortisol ratio in a competition soccer half-season

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OBJECTIVE The changes of creatine kinase plasma levels and testosterone cortisol ratio in some studies are claimed as the first indicators of overreaching or overtraining. The few recent studies have speculated that at the end of competition soccer season in 10-30% of soccer players there were some signs of overreaching or overtraining. The aim of this study was to evaluate the possible relationship between creatine kinase plasma levels and testosterone cortisol ratio during competition soccer half season.

METHODS Before and after a maximal exercise treadmill test the venous blood was taken. Serum levels of testosterone and plasma levels of cortisol were determinate by RIA method and plasma levels of creatine kinase by DEROM method, before and after the maximal exercise test. Descriptive statistics, ANOVA and correlations were used.

RESULTS There were significant differences of plasma levels of creatine kinase and testosterone cortisol ratio between three periods of training process during the competition half-season. At the same time, there were some significant correlations between plasma levels of creatine kinase and testosterone cortisol ratio.

CONCLUSION These findings indicated that there was some disadaptation, especially at the end of competition season. Without tests of specific soccer performances, it couldn't be concluded that these results showed some signs of overreaching or overtraining.

KEY WORDS Soccer, creatine kinase, testosterone, cortisol, overreaching, overtraining.

P-048 Knee functions in soccer players after anterior cruciate ligament reconstruction

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OBJECTIVE Isokinetic measurements and functional tests are often used to assess knee functions following anterior cruciate ligament (ACL) reconstruction using the opposite leg as a control (Nakayama et al., 2000; Pigozzi et al., 2004). The purpose of this study were to examine the relationship among isokinetic knee extensor strength in 60°/sec, hop and vertical jump strength tests, and to determine differences between the involved and uninjured leg in soccer players after ACL reconstruction.

METHODS Twenty-one soccer players (mean age: 25.16 ± 6.5 years) undergone with arthroscopic ACL reconstruction using bone-patellar tendon-bone at a 1 year follow-up participated to isokinetic measurement in 60°/sec (CYBEX 6000), hop and vertical jump (VJ) strength tests including involved and uninjured leg. Mean time for testing was 26 weeks following surgery.

RESULTS There were significant differences between 60°/sec extensor peak torque (PT) and hop test results ($r = .42$ ($p < 0.05$), $r = .39$ ($p > 0.05$), respectively) and 60°/sec extensor PT and VJ test ($r = -.27$ ($p > 0.05$), $r = .42$ ($p < 0.05$), respectively) with involved and uninjured legs. The mean quadriceps muscle strength of the injured side was 75 % of that of the uninjured side.

CONCLUSION The results of this study suggested that knee extensor strength and hop tests of both sides were effective in the functional performance of the lower limb following ACL reconstruction up to 26 weeks postoperatively. Knee functions tests were suggested as a reference guide for the outcome of rehabilitation programme.

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KEY WORDS Isokinetic, muscle strength, soccer players, vertical jump.

P-049 Injury statistics in a competitive football team

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OBJECTIVE The increased number of trainings and matches, evaluated in concordance with the increasing physical demands of modern football have increased the number and severity of football related injuries. Some football institutions have developed strategies and research projects to elicit scientific data bases to understand the injury mechanisms, incidence of injuries, and anatomic sites mostly involved. The objective of this study was to obtain a statistical survey of injuries of a high level competing professional football team.

METHODS The subjects involved in the study were professional players of a high level competing team. Injury sites, types, mechanisms and durations are noted along the 2005-06 season starting from the first practice of the preparation period until the last game of the season. Injury rates were calculated number per 1000 hours of activity (trainings and matches). Frequency analysis was used for statistical evaluation.

RESULTS A total of 127 injuries were recorded in 2005-06 season. The most and least involved injury site and mechanisms were knee (20,75%), head/face/neck (3,77%), strain (31,25%), fracture&dislocation (1%, 0%) respectively. Injury rate was 14/1000 h.

CONCLUSION The results of this study differed from some previously published studies in injury risk (rate), mechanism, and involved site statistics. It was concluded that the variation of external conditions (climate, training programs, study period, etc.) was the reason most responsible for the difference. Standardization of the studied methods may lead to increased reliability of the results.

KEY WORDS Football, soccer, injury statistic, injury mechanism, injury risk

P-050 Effect of long term soccer on spinal mobility and lumbar spine degeneration

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OBJECTIVE A new computerized device for measuring sagittal spinal range of motion was used for to detect the effect of long term playing soccer. The purpose of this study was to evaluate the effect of playing soccer for long term on spinal mobility, and to analyse the relationship between spinal mobility and lumbar spine degeneration (LSD).

METHODS There have been twenty-two participants in this study (6 active soccer players & 6 controls, 5 veteran players & 5 controls). The assessment of the spine was performed in the upright position and at maximal flex/ext by means of the Spinal Mouse®. Plain lateral radiographs were taken to determine the degenerative change of lumbar vertebrae.

RESULTS Findings of this study demonstrated that there was no significant difference among studied groups in terms of spinal mobility ($p < 0.05$). However, spinal mobility showed significant correlations with spinal degeneration scores ($p < 0.05$).

CONCLUSION In conclusion, long term playing soccer had no effect on spinal mobility.

KEY WORDS Spinal Mouse, spinal mobility, soccer, degeneration

P-051 Biofeedback for improving weight-bearing following lower limb football injuries: A new assessment and rehabilitation device

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OBJECTIVE One of the primary objectives of early rehabilitation in soccer and football players who have undergone lower limb trauma or surgery is to return them to full weight-bearing as quickly as possible. Even though biofeedback systems give more reliable, accurate and objective data compared to clinical examination and scales, they have so far not been utilized in sports rehabilitation. The purpose of this study is to present and test a new weight-bearing auditory and visual biofeedback insole device using numerous case studies in order to assess the feedback responses in sports persons with lower limb football injuries.

METHODS Patients, who had undergone various orthopaedic surgeries following football trauma were tested using the new insole device. If a weight-bearing discrepancy was noted on evaluation, the new patient-customized auditory feedback device was employed in order to attempt to restore equal weight-bearing in bilateral limbs.

RESULTS Whilst using the new patient-customized auditory feedback device, accurate weight-bearing comparisons between bilateral lower limbs were recorded. After a single session utilizing the feedback device, weight-bearing values were objectively and statistically improved and in some cases maintained without the feedback device being further employed.

CONCLUSION Soccer and football players need to return to full weight-bearing rapidly following injury or surgery. Use of the new patient-customized auditory feedback device provides a more accurate and rapid rehabilitation tool than previous methods. In this study it was demonstrated that audio biofeedback was useful in stimulating added weight-bearing in cases with significant load difference between the affected an

KEY WORDS Biofeedback, gait rehabilitation, lower-limb trauma

P-052 Percutaneous headless screw fixation in surgical treatment of jones fracture in professional football players

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OBJECTIVE Jones fracture is most frequently related to chronic stress, especially in the athlete. The fracture has been treated operatively and nonoperatively. Operative treatment is often recommended for the athlete (Quill 1995). But the optimal surgical treatment has not been determined. Intramedullary screw fixation is popular because of return to competitive sports. The purpose was to present a case of a professional football player with Jones fractures who was treated with percutaneous Acutrak screw fixation. It was hypothesized that surgical fixation of acute Jones fractures would result in shorter times to union and return to athletics compared with cast treatment.

METHODS A case study was conducted with a professional football player (age:26) who underwent internal fixation using Percutaneous an Acutrak screw under local anaesthesia with the aid of fluoroscopy.

RESULTS Clinical healing was obtained at a mean 6 weeks postoperatively. Radiographic consolidation occurred at a mean 8 weeks. Patients returned to their preinjury activity levels at 11 weeks postoperatively. No postoperative complication was set.

DISCUSSION Jones fractures was first described by Kavanaugh et al in 1978 since. Then high success rates have been produced in many studies to minimize the risk of non-union, delayed union, and possible refracture, and to decrease the return time to athletic activity (Reese et al. 2004). The Acutrak system is made from titanium alloy and is a fully threaded, self-tapping, cannulated screw and tapered headless screw (Faran et al. 1999).

CONCLUSION The screw head problems were encountered in the more traditional AO screw techniques. However, Acutrak didn't irritate to skin due to a headless screw. The results suggested that Acutrak may be the treatment in professional football players with Jones fractures. In spite of factors such as ease of implementation, cost, and resistance to bending also needs to be considered.

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KEY WORDS Jones fracture, intramedullary screw fixation, surgical treatment, Acutrak screw

P-053 Injury evaluation of Turkish national men's football team

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OBJECTIVE National Teams are squads composed by the most elite players of countries. The public interest for the national games is also very high. In addition to these two factors, the level of the game played between national teams is very demanding in the nature. So, injury and its treatment has become very important determining factors for the success of the teams. The aim of the study was to demonstrate the incidence and general characteristics of injuries experienced in Turkish National Football Team between years 2000 and 2005.

METHODS The affected body part, type of injury and applied treatment procedures during official and friendly games and their preparation periods were recorded by the medical staff on a daily basis. The data reveals a six years period between 01.01.2000 and 31.12.2005. Cross tabulation, frequency analysis, descriptive statistics and Chi-Square tests are used for statistical evaluations.

RESULTS Along the study period, 208 trainings and 52 matches were recorded. The averages of 108 total injuries per match and training were 1.0 and 0.27, respectively. 80.6 % of the injuries affected lower extremities. The most common

injury area was thigh with 25 %, the most common injury type was contusion with 32 %, and the treatment was mostly (PTR) (89.8 %). 37 % of the injuries recovered in 1-3 days.

CONCLUSION Being a considerable long follow up period of injuries (6 years) in National Football Team and being followed and documented by the same medical staff, statistical data presents valuable information about incidence, affected body part, type and severity of injuries in European football. The data may serve as a reference for the subsequent research studies.

KEY WORDS Football, injury incidence rate, Turkish National Team.

P-054 Enthesis pain and growth height velocity curve in junior high school soccer players

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OBJECTIVE The entheses pain, which occur frequently among young athletes, may be caused by an imbalance in physical growth. The purpose of this study was to examine the relationship between the growth height velocity curve and entheses pain of the lower extremity among the junior high school soccer players.

METHODS The subjects were 107 male students from soccer clubs of 3 junior high schools (47, 23, and 37 students, respectively) in Gunma prefecture. The entheses pain and the onset time was investigated by interview. The heights measurements from the 1st grade of elementary school to the grade at the time of this study were collected. The phases of height growth velocity curve were determined according to Murata's classification (1996). The phase at the onset time of entheses pain was investigated.

RESULTS Eight subjects were in phase I at the time of measurement, 48 subjects in phase II, and 48 subjects in phase III. The number of entheses pain was 32 subjects (31%). The onset time could be confirmed in 29 of the 32 subjects who reported entheses pain. The phase at the time of onset was I in 5 subjects, II in 19, and III in 5, showing that entheses pain most frequently occurred in phase II.

CONCLUSION In phase II, height rapidly increased and the growth of bones and muscles/tendons were imbalanced. Promotion of the evaluation of development age using the height growth velocity curve, and calling attention to the possible occurrence of entheses pain and adjustment of the training level, particularly for players in phase II, were important to prevent sporting injuries during the growth period.

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KEY WORDS Growth period, entheses pain, injury prevention

P-055 Learning condition and effectiveness of stretching in junior high school soccer players

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OBJECTIVE Frequency of overuse injuries is higher than traumatic injuries of soccer players in growth period and the injury of the lower extremity is higher than upper extremity for the characteristic of soccer. Stretching is widely performed because it is considered to be effective in prevention of the injuries. However it was reported that stretching wasn't performed correctly. The purpose of this study was to examine the possibility of preventing the injuries in growth period by guiding stretching for long term and checking the learning condition and effectiveness of the stretching.

METHODS The subjects were 39 male junior high school soccer players. They were guided and checked for performing the stretching and measured muscle tightness once a month for 6 month. The learning condition of the stretching was checked into three steps A: correctly stretched, B: stretched by wrong way, C: not stretched. Frequency of step A was examined and the paired t-test first and each measurement muscle tightness was used.

RESULTS As the result of paired t-test first and each measurement, a significant difference was observed in bilateral ilio-psoas, adductors, hamstrings and gastrocreminus. The subjects perform who performed stretching at home was 33, (85%). The frequency of step A subjects at first were: iliopsoas 20%, adductors 50%, quadriceps and hamstrings 47% and finally iliopsoas 72%, adductors 64%, quadriceps 69% and hamstring 51%.

CONCLUSION Necessity of guiding stretching continuously was suggested, because the number of step A subjects was in proportion to the times of guidance. The learning condition differed from each muscle, so that stretching of adductors and hamstrings should be performed carefully about pelvic position. Continuous guided stretching was suggested to prevent the injuries in the growth period.

KEY WORDS Growth period, stretching, prevention of injuries

P-056 Medical support in Gunma Football Association U-18 tournaments: Role of physical therapist

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OBJECTIVE Although it is reported that sports damage incidence of a soccer player is high, there are still a few senior high schools where a trainer corresponding to them belongs to exclusive belonging (Sakamoto et al. 1998). We arrange contents of medical support by (PT) in four Gunma Senior High School soccer competition meetings of 2004-2005 and clarify a future problem.

METHODS In collaboration with the Gunma Football Association, a total of 189 school teams (246 games) in the four Gunma Football Association U-18 tournaments in 2004 - 2005 were provisioned with medical support.

RESULTS A total of 205 physical therapists took part, a total of 514 players received medical support, and 847 cases were handled in all. Taping, ice therapy, stretching, homeostasis, diagnosis of injury and exercise guidance were the most frequently required services, with taping being dominant.

DISCUSSION Taping of the ankle joint was common, a pattern seen in past injury investigation reports, suggesting the future direction of medical support. It was suggested that PT may lead in damage prevention and improvement of self-care of players. It was further suggested that there was a need to plan cooperation with supervision and coach, player and PT with time through medical support.

REFERENCES

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KEY WORDS High school soccer, medical support, injury prevention

P-057 Effect of leg cooling at half time breaks on performance of soccer-simulated exercise in hot environment

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OBJECTIVE It is well known that precooling improves exercise performance due to the reduced physiological strain in hot environment (Quod et al., 2006; Drust et al., 2000). Although it has been reported that precooling is of no significant benefit for intermittent exercise (2), it is not clear whether performance of intermittent exercise in the second half

is affected by body cooling at half time breaks. The aim of this study was to examine the effect of leg cooling at half time breaks for soccer-related performance in the hot environment.

METHODS Five college soccer players completed two trials on separate day, involving leg cooling by water immersion for 5 min (LC) or no leg cooling (NC) at half time breaks. Heart rate, concentration of blood lactate, intra-ear temperature, RPE, thirst level, and body water loss were measured. Performance of skill and physical tests were also evaluated in soccer-simulated exercise protocol every 5 min.

RESULTS Environmental condition was 32.11 \pm 0.41 degree C in WBGT. La, Tie, and sweat rate were not different between two trials, but heart rate in second half was significantly lower in the LC compared with in the NC. Although there was no difference in technical performances between two trials, result of time of 30 m sprint in second half was significantly better in the LC compared to NC.

CONCLUSION The results of this study suggested that leg cooling for only 5 min at half time breaks reduced cardio-respiratory strain and improved sprint performance in second half. The ability to sprint at high velocity was essential for performance in soccer. Therefore, it was recommended that leg cooling should be encouraged at half time breaks.

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Quod et al. (2006) *Sports Medecine* 36, 671-682.

KEY WORDS Soccer, cooling, performance.

P-058 Magnetic resonance image in athlete with groin pain

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OBJECTIVE Although groin pain is common in athletes, it is difficult to be diagnosed. In order to reveal unknown aetiology of groin pain (Brennan 2005), the imaging study has been applied to the athlete complaining of groin pain (Meyers 2005). The aim of this study was to clarify the prevalence of the abnormal sign in MR findings of the athlete with groin pain.

METHODS 18 athletes with groin pain were included in the study. All patients were male. The average age was 17.6 years old. The athletes underwent MRI (coronal T1-weighted, T2-weighted, and short inversion time inversion-recovery (STIR) imaging, and axial T2-weighted and STIR imaging) to the body of the pelvis. Any abnormal sign in the image was detected by two different orthopedic surgeons.

RESULTS The secondary cleft sign and bone marrow oedema were found in 52 % and 48 % of patients, respectively. The linear high intensity signal along the inferior margin of the pubic ramus was depicted in 32 % of the patient in T2-weighted and STIR imaging.

DISCUSSION Since more than half of cases showed secondary cleft sign (Brennan 2005), it may be one of significant markers for groin pain. This sign was probably due to inflammatory changes caused by micro-avulsion at the enthesis of adductor muscles under the prolonged traction force. Further investigation is needed to clarify the discrepancy between symptoms and the MR findings.

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KEY WORDS MRI, groin pain, secondary cleft sign, bone marrow oedema.

P-059 Athletic rehabilitation of soccer players with groin pain

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OBJECTIVE Groin pain is a common symptom (Holmih et al. 2004; Nozaki 2006) among soccer players; however an appropriate rehabilitation program for groin pain is unclear. An athletic rehabilitation program was introduced for groin pain with observed dynamic alignment.

METHODS Athletic rehabilitation was applied to 19 male soccer players who complained from groin pain syndrome until they returned to the game (mean age: 16.3 ± 3.3). Balance training and coordination training aimed at improving the dynamic alignment were stressed and real athletic movements were introduced gradually.

RESULTS Regarding dynamic alignment, a knee-in position from a lunge motion, or Trendelenburg's sign, was positive during single leg standing in all patients. 98.6 ± 81.3 days in average were required before their return to the game.

CONCLUSION Balance training and coordination training of the whole body were applied throughout the rehabilitation program. In all patients, groin pain disappeared and dynamic alignment improved, therefore all patients were able to return to playing soccer. Moreover, since groin pain and muscle tonus always changed, the condition of the subjects should be carefully observed.

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KEY WORDS Groin pain, athletic rehabilitation, dynamic alignment

P-060 Effects of injury related de-training on gross motor performance in elite soccer players

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OBJECTIVE Soccer is a dynamic contact sport with a high incidence of injury. When injured, players experience a reduced or altered training stimulus compared with normal training. Such loads may lead to de-training and a subsequent inability to fulfil the technical, tactical and physical demands of the sport on return to competition. This may increase the potential for re-injury. To identify the potential for de-training to occur for a professional soccer team by quantifying the length of absences associated with injury. To evaluate changes in gross motor performance on a soccer-related test battery following injury induced alterations in training.

METHODS All attendance and absence from training were recorded using a daily register throughout the 2004-2005 season for all professional players ($N = 27$). Injury severity was categorised according to the total number of days players were unavailable to train. All players also completed a soccer-related test battery when fit and following injury immediately prior to re-joining normal squad training.

RESULTS Absences of 7-14days ($n=36$), 15-28 days ($n=9$), 29-60 days ($n=10$) and >60 days ($n=4$) was noted. No significant difference on any test performance was observed for absences of <15 days. Absences of >14 days resulted in reductions ($p<0.05$) in agility (pre 6.2 ± 0.3 ; post 6.3 ± 0.3 s), repeated sprint (pre $7.4 \pm 5.5\%$; post $8.3 \pm 6.3\%$) and estimated aerobic fitness (pre 56.1 ± 5.2 ; post 54.5 ± 4.9 ml/kg/min).

CONCLUSION Absence from training of >14 days leads to a reduction in performance in anaerobic and aerobic fitness. Absences of this length may occur up to 23 times per season. As a consequence players may be required to compete with reduced fitness levels following injury. This data suggests that careful consideration should be given to both rehabilitation and the time for players to return to competition

KEY WORDS Injury, de-training, test performance.

P-061 Influence of soccer specific fatigue on knee joint kinematics during dynamic landings

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OBJECTIVE Epidemiological data suggests that more soccer injuries occur during the latter stages of match-play, with fatigue cited as a contributing factor. Primary non-contact injury mechanisms include landing and turning. Single legged hopping tasks are often used to investigate the mechanisms of injury, but typically in the rested state with no

consideration given to the influence of fatigue. The aim was to investigate the time-course of soccer-specific fatigue on knee joint kinematics during single legged hopping tasks (inversion cut, eversion cut and planar hop for height). The exercise protocol was based on notational analyses of match-play. The hopping tasks were representative of the multi-directional nature of soccer, and the pre-habilitative work conducted during training.

METHODS Eight professional soccer players completed a 90 min treadmill protocol, comprising six repetitions of a 15 min activity bout and a 15 min passive half-time interval. At rest, and subsequently at 15 min intervals, each player completed the three hopping trials in randomised order. Frontal and sagittal plane knee joint kinematics were quantified during landing using automated motion analysis.

RESULTS Knee joint kinematics at touchdown were characterised by flexion ($\sim 30^\circ$) and varus ($\sim 7^\circ$). Knee flexion at touchdown was not affected ($P \geq 0.05$) by exercise duration, but varus tended to increase during the simulated match. The increase in varus during the landing phase was greatest in the inversion hop. Knee varus during the planar hop for height was affected by the passive half-time interval.

Table 1. Knee joint angle (degrees) at touchdown during simulated soccer match-play.

Time (min)	<i>Inversion Cut</i>		<i>Eversion Cut</i>		<i>Planar Hop</i>	
	Flexion	Varus	Flexion	Varus	Flexion	Varus
0	29.95(12.99)	4.68(4.87)	28.19(4.73)	7.40(4.42)	26.75(5.58)	5.83(3.90)
15	31.69(5.51)	8.11(7.01)	29.09(3.64)	8.81(5.77)	28.63(5.00)	7.34(6.18)
30	34.99(7.22)	8.64(7.66)	28.47(5.59)	9.92(5.12)	30.80(5.16)	8.58(5.75)
45	30.83(5.03)	7.90(7.62)	29.74(3.80)	10.66(5.69)	27.77(6.36)	9.13(6.19)
60	34.84(9.14)	8.70(5.63)	31.32(7.07)	9.48(6.76)	30.42(5.85)	7.40(5.74)
75	35.95(7.90)	10.36(7.64)	26.11(4.90)	8.42(6.92)	32.08(9.30)	9.19(6.54)
90	28.25(5.97)	10.27(7.60)	30.10(4.98)	10.50(5.54)	27.51(5.28)	8.63(6.45)
105	31.73(9.46)	10.60(8.57)	27.67(4.52)	10.37(4.91)	27.18(5.95)	8.65(5.59)

DISCUSSION Joint flexion serves as a protective mechanism during landing, but knee varus increases the risk of injury. The data suggests a predisposition to knee varus in these professional players, and the influence of fatigue further increases the risk of lateral knee instability. The temporal pattern of kinematic modifications supports epidemiological observations of injury incidence during match-play.

KEY WORDS Soccer-specific fatigue, knee kinematics, inversion and eversion cutting.

P-062 Influence of soccer-specific fatigue on kinematics of kicking

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OBJECTIVE Kicking is a primary mechanism for muscular strain injuries in soccer. Injury incidence has been observed to increase during the latter stages of match-play, with fatigue cited as a contributing factor. Yet, whilst there are many biomechanical analyses of kicking, few have attempted to examine the influence of soccer-specific fatigue on changes in technique and the implications for injury (Aprianono et al., 2006). The aim of the study was to investigate the time-course of soccer-specific fatigue on the kinematics of a maximal velocity soccer kick. The exercise protocol was based on notational analyses of match-play. Kicking performance was quantified as foot speed at ball contact, with technique considered as the contribution of the stretch-shortening action, proximal-distal sequencing, and long-axis rotation.

METHODS Eight professional soccer players completed a 90 min treadmill protocol, comprising six repetitions of a 15 min activity bout and a 15 min passive half-time interval. At rest and subsequently at 15 min intervals, the player completed a maximal velocity kick. Segmental kinematics describing each of the three mechanisms contributing to performance were collected using automated motion analysis.

RESULTS Foot velocity at ball contact was maintained ($\sim 20 \text{ m}\cdot\text{s}^{-1}$) during the protocol. However, the duration of the stretch-reflex mechanism increased during each half, and the thigh segment became increasingly dominant in the proximal-distal transfer at the expense of shank rotation. This alteration was facilitated by increased pelvic rotation suggesting greater contribution from long-axis rotation.

CONCLUSION Whilst kicking performance was maintained, a fatigue affect was evident as a kinematic alteration in technique. Specifically, the duration of the stretch-reflex mechanism, the range of thigh rotation, and the range of pelvic

rotation all increased to facilitate the maintenance of performance. These kinematic modifications in the fatigued state increased the risk of injury across multiple sites.

Table 1. Time-history of kicking mechanisms descriptors during simulated soccer match-play.

Time(min)	Foot speed at contact (m·s ⁻¹)	Stretch-Reflex duration (s)	Range of thigh rotation (°)	Range of pelvic rotation (°)
0	18.77 (0.92)	0.021 (0.017)	34.02 (10.31)	8.49 (6.10)
15	18.83 (1.32)	0.029 (0.015)	34.28 (9.32)	8.18 (4.01)
30	19.69 (1.28)	0.029 (0.021)	38.97 (11.52)	9.17 (5.56)
45	19.03 (1.44)	0.039 (0.008)	38.35 (13.80)	10.20 (5.06)
60	19.60 (1.77)	0.026 (0.015)	37.33 (11.94)	8.34 (5.06)
75	18.53 (1.11)	0.030 (0.010)	31.86 (13.77)	8.15 (5.24)
90	18.18 (1.24)	0.032 (0.008)	33.77 (13.01)	7.62 (7.34)
105	18.45 (1.28)	0.021 (0.017)	37.38 (9.00)	8.52 (4.76)

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KEY WORDS Soccer-specific fatigue, muscular strain injuries, kicking

P-063 Injury survey of young competitive football players

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OBJECTIVE Injuries in youth football is a big concern. The increased number of trainings and matches of young players most probably also increases the number and severity of injuries. Experiencing injuries of various seriousness at the beginning of their football career, young talents may retire earlier than expected, or the game is no longer fun. The objective of this study was to elicit a scientific data base and create a frame work to understand the injury mechanisms, incidence of injuries, anatomic sites mostly involved, etc.

METHODS Injury sites, mechanisms and exposition events of 94 young male players (age:16,03±1,72) of a high level competing club, were evaluated through registered injury cases along 2004-05 season. The exposure time was calculated by multiplication of training times with the number of attending players. Injury rates were calculated number per 1000 hours of activity (trainings and matches). Frequency analysis was used for the statistical evaluation.

RESULTS 202 injuries were recorded. Young players of different competitive groups had trained 33840 hours in total. The injury rate was 5,97/1000 h. The most and least 1), injured sites were ankle and head&neck (35, 17,33 %; 4, 1,98 %), 2), recorded mechanisms were contusion and others (66, 32,67 %; 7, 3,46 %) respectively. 24,75 % of injuries occurred during match situations and the rest were during training.

DISCUSSION The injury rate/risk was lower, injury site and classification ratios also differed in comparison to some previously published older group studies. Injuries during a match were approximately 1,5 fold more then trainings, which is much less then in comparison with older group study results. So, injury risk, site and mechanisms differ in young players and further studies are required.

KEY WORDS football, soccer, young player, injury, injury mechanism.

P-064 Spondylolysis in adolescent and pediatric soccer players

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OBJECTIVE Low back pain is a common problem in young athletes (Gregory et al., 2004; El Rassi et al., 2005). Sports which cause repeated flexion and hyperextension and forced rotation of lumbar spine may cause spondylolysis. Additionally a high velocity kick may cause acute onset of the symptoms. The purpose of the study was to retrospectively examine adolescence soccer players who were diagnosed as sypondylolysis and discuss the symptomathology, diagnostic methods, treatment and recovery period.

METHODS Players who played in Spanish Soccer Association Catalan Delegation and who have been diagnosed for spondylolysis between 2000-20004 were analyzed retrospectively. Age, gender, level and side of the lesion duration of the symptoms, treatment and recovery time were assessed. 34 patients were followed minimum 18 months. All patients were male. Radiographic assesment was made by X-Ray and Gamma-SPECT.

RESULTS In 70.5% of the patients spondylolytic lesions were located at L5.61.7% patients were bilaterally injured.6 was right and 7 were left sided. Mean duration of the symptoms from onset to the first clinic visit was 3.4 months(1 week-24 months). All the patients were stopped playing soccer after the diagnosis for 7.26 months(3-20). 44%(15) of the patients had antilordotic toracolumbosacral orthosis.

DISCUSSION Spondylolysis may be presented as false negative in 23.5% of the patients on X-Rays and further investigations should be considered. It was suggested that the physician should be aware of all diagnostic tools and carefull about the timing of return to sports.

REFERENCES

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KEY WORDS Spondylolysis, soccer, low back pain.

P-065 Prevention of non-contact injuries in soccer

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OBJECTIVE The classifications, pathologies, conservative and surgical treatments of injuries in soccer have undoubtedly formed the mainstay of medical literature over the past decades. Despite the rapid increase in the incidence and medical costs involved in these injuries, little attention has been placed on their prevention. This systematic literature review presented the current available evidence regarding the mechanisms of non-contact injuries, as well as the reported methods of prevention and their success in the reduction of these injuries.

METHODS A comprehensive literature search was conducted using the Cochrane Musculoskeletal Injuries Group's specialized register, MEDLINE, PubMed, EMBASE and CINAHL. Video clips were utilized in order to visually highlight the mechanisms involved as well as present the methods employed to prevent these injuries.

RESULTS Significant reductions in the incidence of non-contact knee injuries have been shown in various studies. These have included perturbation techniques, plyometric and sportmetric activities, as well as skill and neuromuscular rehabilitation.

DISCUSSION Not all non-contact knee injuries could be prevented, however there was strong evidence that prevention programs that focused on preparatory muscle activity through muscle strength training, perturbation training, endurance, plyometrics, and skill training could be effective in reducing these injuries in soccer. The outcome of these prevention programs may ultimately result in a more skilled and more biomechanically sound athlete.

KEY WORDS Prevention programs, plyometrics, skill training.