



Injuries in elite youth football players: a prospective three-year study

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Objective: The aim of this study was to investigate the incidence and nature of injuries and the influence of age on injury patterns in elite youth football.

Methods: Fifty-two players of the Under-17 (U-17) male national youth football team were followed during their progression to U-18 and U-19. Individual player exposure and injuries were recorded during the three year study period.

Results: Injury incidence was five times higher during matches than training. When medical attention and time loss injuries were considered, injury incidence increased during matches and decreased during training with increasing age. Traumatic injuries were more frequent in matches and were linked with increased age. Overuse injuries were two times higher during training than matches in the U-17 team. The majority of traumatic match injuries (78.3%) led to time loss and the majority of time loss injuries occurred due to traumatic mechanism (62.1%). The majority of muscle and entire ligament injuries occurred during training and contusions during competition. Re-injury rate was 25% and were all overuse injuries.

Conclusion: Injury incidences increased during matches and decreased during training. More match injuries were caused by traumatic mechanisms as players aged. Player age might contribute to injury incidence and characteristics in youth football.

Key words: Injury incidence; national team; youth football.

Injury studies are essential for ensuring the health and safety of young football players and for providing evidence-based preventive interventions. In youth football, data is generally collected during a couple of seasons or tournaments. However, inconsistent study results with respect to the age and skill level investigated, injury definitions and methodologies make comparative analysis complicated.^[1-3] Therefore, studies conducted with a prospective cohort design are necessary.^[4-6] As prospec-

tive injury studies in youth football are limited, continuous data are needed to identify these groups, particularly from elite levels, with respect to trends over time in injury risk and profiles.^[7,8] To the best of our knowledge, there are only three published longitudinal studies reporting the risk for injury at the senior national team level.^[9-11] However, longitudinal data on the incidence, nature and consequences of injuries at the national youth football level do not exist in the current literature.

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Therefore, based on previously suggested injury definitions,^[6] this study focuses on the incidence and nature of injuries as well as the influence of age on injury patterns at the national youth team level.

Materials and methods

In this prospective study, the Under-17 (U-17) male national football team was followed by the same team physician during their progression to the U-18 and U-19 teams, beginning with the 2005-2006 season. Fifty-two different players were registered over the three year study period. The physical characteristics of the players are detailed in Table 1.

Data from players who joined a team during a tournament as a replacement for an injured player or who left the national team during the course of the study for any reason were included for their participation period. All players and/or parents received information regarding the study design and signed a written informed consent. Approved for the study was obtained by the Medical Committee of the Turkish Football Federation.

Injury definitions used in this study followed the recommendations made by the International Injury Consensus Group; injuries requiring medical attention were classified as 'medical attention', injuries resulting in the player being unable to fully participate in future football training or match as 'time loss', recurrent injuries occurring within two months of a player's return to full participation as 'early recurrence' and 2 to 12 months after a player's return to full participation as 'late recurrence' injuries.^[6]

Each individual player's exposure time and injuries during a football match or training were recorded. Match

exposure was taken from official records and did not include pre-match warm-up and post-match cool down. Data regarding date of injury, date of return to full participation, training or match injury, injury type and location, traumatic or overuse injury, contact or non-contact, re-injury and diagnosis for each injury were collected. Injury severity was assessed according to the number of days of absence from training and match play (slight: 0 days, minimal: 1 to 3 days, mild: 4 to 7 days, moderate: 8 to 28 days and severe >28 days). Confidentiality of all player data was ensured.

Descriptive statistics, the Pearson's chi-squared, χ^2 (continuity correction and linear-by-linear association) and Fisher's exact tests were used for data analysis using the Epi Info™ statistical program. P values less than 0.05 was considered statistically significant.

Results

Overall, 92 team-training sessions (1,897 training hours) and 32 matches (493.2 match hours) were recorded during the study period. Forty-four injuries were documented among twenty-four (46.2%) players. All injuries were medical attention injuries. Injury incidences were 48.7 and 10.5 for match and training injuries, respectively. Twenty-nine injuries (65.9%) led to time loss, and incidences for match and training were 30.4 and 7.4 per 1000 hours, respectively (Tables 1 and 2).

Traumatic injuries represented 52.3% of all injuries and the remainder were due to overuse. A greater proportion of traumatic injuries occurred in competition (69.6%) although this difference was not statistically significant ($p=0.068$), (Table 3). Overuse injury occurred at similar rates during training and matches ($p=0.577$).

Table 1. Physical characteristics (mean \pm SD) and exposure of players.

	U-17	U-18	U-19	
Height (cm)	179.37 \pm 5.72	178.83 \pm 5.18	180.39 \pm 5.52	
Weight (kg)	71.74 \pm 6.65	72.06 \pm 6.47	74.78 \pm 6.21	
BMI (kg/m ²)	22.30 \pm 4.32	22.53 \pm 5.30	22.98 \pm 5.43	
				Total
No. of matches	19	4	9	32
No. of training sessions	53	10	29	92
Match hours	278.7	66	148.5	493.2
Training hours	1009.1	264	623.9	1897
	TLI	MAI	TLI	MAI
Injuries/1000 hours				
Match play	21.5	35.9	15.2	45.5
Training	11.9	14.9	0	7.6
Total	14	19.4	3	15.2
	TLI	MAI	TLI	MAI

MAI: Medical attention injury, TLI: Time loss injury

The majority of injuries (79.5%) were lower extremity injuries. The most frequent locations were the thigh (31.8%), hip/groin (25%), followed by the lower back (11.4%), ankle (9.1%), knee (6.8%), head and neck (6.8%), lower leg (4.6%), thorax (2.3%), and foot (2.3%).

Muscle injuries were the most common type of injury (61.4%), followed by contusions (20.5%). The most frequent diagnosis in muscle injuries was strain (81.5%), with locations at the adductor in 11, hamstring in 6, quadriceps in 4 and gastrosoleus in one (Table 2). The

Table 2. Injury characteristics.

	U-17		U-18		U-19		Total	
	TLI	MAI	TLI	MAI	TLI	MAI	TLI	MAI
Injury mechanisms								
Overuse injuries	7/18 (38.9%)	12/25 (48%)	0	2/5 (40%)	4/10 (40%)	7/14 (50%)	11/29 (37.9%)	21/44 (47.7%)
Traumatic injuries	11/18 (61.1%)	13/25 (52%)	1/1 (100%)	3/5 (60%)	6/10 (60%)	7/14 (50%)	18/29 (62.1%)	23/44 (52.3%)
Player contact	3/11	4/13	1/1	3/3	4/6	5/7	8/18	12/23
Object contact	0	1/13	0	0	1/6	1/7	1/18	2/23
Non-contact	8/11	8/13	0	0	1/6	1/7	9/18	9/23
Re-injuries	2/4 (50%)	5/11 (45.5%)	0	2/11 (18.2%)	2/4 (50%)	4/11 (36.3%)	4/11 (36.3%)	11/11 (100%)
Injury severity								
Slight	0	7/25 (28%)	0	4/5 (80%)	0	4/14 (28.6%)	0	15/44 (34.1%)
Minimal	11/18 (61.1%)	11/25 (44%)	0	0	5/10 (50%)	5/14 (35.7%)	16/29 (55.2%)	16/44 (36.3%)
Mild	4/18 (22.2%)	4/25 (16%)	0	0	1/10 (10%)	1/14 (7.1%)	5/29 (17.3%)	5/44 (11.4%)
Moderate	3/18 (16.7%)	3/25 (12%)	1/1 (100%)	1/5 (20%)	3/10 (30%)	3/14 (21.5%)	7/29 (24.1%)	7/44 (15.9%)
Severe	0	0	0	0	1/10	1/14	1/29	1/44
Injury type								
Ligament injury	4/18	4/25	0	0	0	0	4/29	4/44
Muscle injury	11/18 (61.1%)	17/25 (68%)	0	2/5 (40%)	5/10 (50%)	8/14 (57.2%)	16/29 (55.2%)	27/44 (61.4%)
Tendon injury	0	0	0	0	1/10	1/14	1/29	1/44
Contusions	2/18 (11.1%)	2/25 (8%)	1/1 (100%)	3/5 (60%)	3/10 (30%)	4/14 (28.6%)	6/29 (20.7%)	9/44 (20.4%)
Lacerations	0	1/25	0	0	0	0	0	1/44
Concussions	1/18	1/25	0	0	1/10	1/14	2/29	2/44
Injury location								
Head/Neck	1/18 (5.6%)	2/25 (8%)	0	0	1/10 (10%)	1/14 (7.1%)	2/29 (6.9%)	3/44 (6.8%)
Lower back/Pelvis/Trunk	0	1/25 (4%)	1/1 (100%)	3/5 (60%)	0	2/14 (14.3%)	1/29 (3.4%)	6/44 (13.6%)
Hip/Groin	5/18 (27.8%)	8/25 (32%)	0	0	3/10 (30%)	3/14 (21.5%)	8/29 (27.6%)	11/44 (25%)
Thigh	6/18 (33.3%)	8/25 (32%)	0	0	4/10 (40%)	6/14 (42.9%)	10/29 (34.5%)	14/44 (31.8%)
Knee	2/18 (11.1%)	2/25 (8%)	0	0	1/10 (10%)	1/14 (7.1%)	3/29 (10.4%)	3/44 (6.8%)
Lower leg	2/18 (11.1%)	2/25 (8%)	0	0	0	0	2/29 (6.9%)	2/44 (4.6%)
Ankle	2/18 (11.1%)	2/25 (8%)	0	2/5 (40%)	0	0	2/29 (6.9%)	4/44 (9.1%)
Foot	0	0	0	0	1/10 (10%)	1/14 (7.1%)	1/29 (3.4%)	1/44 (2.3%)

MAI: Medical attention injury, TLI: Time loss injury

majority of muscle injuries ($p=0.030$) and all ligament injuries ($p=0.036$) occurred during training while most contusions (88.9%) occurred during competition ($p=0.020$) (Table 3).

Furthermore, there were 11 re-injuries (25%), 9 early and 2 late recurrences. Re-injuries were more common during training than matches ($p=0.078$) (Table 3). All re-injuries were overuse injuries.

Twenty-nine injuries (65.9%) were time loss injuries, of which 72.4% resulted in absence of one week or less. The remaining 15 injuries (34.1%) resulted in no absence (Table 2). Most of the moderate injuries (71.4%) and one severe injury occurred during match play (Table 3).

Of traumatic match injuries, the majority (78.3%) led to time loss (Table 2) and 62.1% of time loss injuries

Table 3. Medical attention injury profile in relation to match and training.

	U-17		U-18		U-19		Total	
	Match	Training	Match	Training	Match	Training	Match	Training
No. of MAI	10/25 (40%)	15/25 (60%)	3/5 (60%)	2/5 (40%)	11/14 (78.6%)	3/14 (21.4%)	24/44 (54.5%)	20/44 (45.5%)
Re-injuries	1/5 (20%)	4/5 (80%)	0	2/2 (100%)	2/4 (50%)	2/4 (50%)	3/11 (27.3%)	8/11 (72.7%)
Early	1/5	4/5	0	2/2	2/2	0	3/9	6/9
Late	0	0	0	0	0	2/2	0	2/2
Injury mechanisms								
Overuse injuries	4/12 (33.3%)	8/12 (66.7%)	0	2/2 (100%)	4/7 (57.1%)	3/7 (42.9%)	8/21 (38.1%)	13/21 (61.9%)
Traumatic injuries	6/13 (46.2%)	7/13 (53.8%)	3/3 (100%)	0	7/7 (100%)	0	16/23 (69.6%)	7/23 (30.4%)
Player contact	4/4	0	3/3	0	5/5	0	12/12	0
Object contact	1/1	0	0	0	1/1	0	2/2	0
Non-contact	1/8	7/8	0	0	1/1	0	2/9	7/9
Injury severity								
Slight	4/7 (57.1%)	3/7 (42.9%)	2/4 (50%)	2/4 (50%)	3/4 (75%)	1/4 (25%)	9/15 (60%)	6/15 (40%)
Minimal	4/11 (36.4%)	7/11 (63.8%)	0	0	4/5 (80%)	1/5 (20%)	8/16 (50%)	8/16 (50%)
Mild	1/4 (25%)	3/4 (75%)	0	0	0	1/1 (100%)	1/5 (20%)	4/5 (80%)
Moderate	1/3 (33.3%)	2/3 (66.7%)	1/1 (100%)	0	3/3 (100%)	0	5/7 (71.4%)	2/7 (28.6%)
Severe	0	0	0	0	1/1	0	1/1	0
Injury type								
Ligament injury	0	4/4	0	0	0	0	0	4/4
Muscle injury	6/17 (35.3%)	11/17 (64.7%)	0	2/2 (100%)	5/8 (62.5%)	3/8 (37.5%)	11/27 (40.1%)	16/27 (59.9%)
Tendon injury	0	0	0	0	1/1	0	1/1	0
Contusions	2/2 (100%)	0	2/3 (66.7%)	1/3 (33.3%)	4/4 (100%)	0	8/9 (88.9%)	1/9 (11.1%)
Lacerations	1/1	0	0	0	0	0	1/1	0
Concussions	1/1	0	0	0	1/1	0	2/2	0
Injury location								
Head/Neck	2/2	0	0	0	1/1	0	3/3	0
Lower Back/Pelvis/Trunk	0	1/1 (100%)	1/3 (33.3%)	2/3 (66.7%)	2/2 (100%)	0	3/6 (50%)	3/6 (50%)
Hip/Groin	3/8 (37.5%)	5/8 (62.5%)	0	0	1/3 (33.3%)	2/3 (66.7%)	4/11 (36.4%)	7/11 (63.6%)
Thigh	3/8 (37.5%)	5/8 (62.5%)	0	0	5/6 (83.3%)	1/6 (16.7%)	8/14 (57.1%)	6/14 (42.9%)
Knee	0	2/2	0	0	1/1	0	1/3	2/3
Lower leg	2/2	0	0	0	0	0	2/2	0
Ankle	0	2/2	2/2	0	0	0	2/4	2/4
Foot	0	0	0	0	1/1	0	1/1	0

MAI: Medical attention injury

occurred due to traumatic mechanism. All player and object-contact injuries occurred during matches, 57.1% of which caused time loss while all non-contact injuries led to time loss (Tables 3 and 4).

Re-injuries caused a shorter absence than new injuries, with a mean absence of 2.50 days and 7.24 days, respectively.

Increasing match and decreasing training injury incidences with age were observed in terms of medical attention ($p=0.002$) and time loss ($p<0.0001$) (Table 1).

The distribution of traumatic and overuse injuries was roughly similar in all age groups with respect to medical attention ($p=0.928$) and time loss ($p=0.727$). At the U-18 and U-19 levels, all traumatic injuries occurred in competition, mostly through a contact mechanism. In

Table 4. Time loss injury profile in relation to match and training.

	U-17		U-18		U-19		Total	
	Match	Training	Match	Training	Match	Training	Match	Training
No. of TLI	6/18 (33.3%)	12/18 (66.7%)	1/1 (100%)	0	8/10 (80%)	2/10 (20%)	15/29 (51.7%)	14/29 (48.3%)
Re-injuries	0	2/2 (100%)	0	0	0	2/2 (100%)	0	4/4 (100%)
Early	0	2/2	0	0	0	0	0	2/2
Late	0	0	0	0	0	2/2	0	2/2
Injury mechanisms								
Overuse injuries	2/7 (28.6%)	5/7 (71.4%)	0	0	2/4 (50%)	2/4 (50%)	4/11 (36.4%)	7/11 (63.6%)
Traumatic injuries	4/11 (36.4%)	7/11 (63.6%)	1/1 (100%)	0	6/6 (100%)	0	11/18 (61.1%)	7/18 (38.9%)
Player contact	3/3	0	1/1	0	4/4	0	8/8	0
Object contact	0	0	0	0	1/1	0	1/1	0
Non-contact	1/8	7/8	0	0	1/1	0	2/9	7/9
Injury severity								
Slight	0	0	0	0	0	0	0	0
Minimal	4/11 (36.4%)	7/11 (63.8%)	0	0	4/5 (80%)	1/5 (20%)	8/16 (50%)	8/16 (50%)
Mild	1/4 (25%)	3/4 (75%)	0	0	0	1/1 (100%)	1/5 (20%)	4/5 (80%)
Moderate	1/3 (33.3%)	2/3 (66.7%)	1/1 (100%)	0	3/3 (100%)	0	5/7 (71.4%)	2/7 (28.6%)
Severe	0	0	0	0	1/1	0	1/1	0
Injury type								
Ligament injury	0	4/4	0	0	0	0	0	4/4
Muscle injury	3/11 (27.3%)	8/11 (72.7%)	0	0	3/5 (60%)	2/5 (40%)	6/16 (37.5%)	10/16 (62.5%)
Tendon injury	0	0	0	0	1/1	0	1/1	0
Contusions	2/2 (100%)	0	1/1 (100%)	0	3/3 (100%)	0	6/6 (100%)	0
Lacerations	0	0	0	0	0	0	0	0
Concussions	1/1	0	0	0	1/1	0	2/2	0
Injury location								
Head/Neck	1/1	0	0	0	1/1	0	2/2	0
Lower Back/Pelvis/Trunk	0	0	1/1	0	0	0	1/1	0
Hip/Groin	1/5 (20%)	4/5 (80%)	0	0	1/3 (33.3%)	2/3 (66.7%)	2/8 (25%)	6/8 (75%)
Thigh	2/6 (33.3%)	4/6 (66.7%)	0	0	4/4 (100%)	0	6/10 (60%)	4/10 (40%)
Knee	0	2/2 (100%)	0	0	1/1 (100%)	0	1/3 (33.3%)	2/3 (66.7%)
Lower leg	2/2	0	0	0	0	0	2/2	0
Ankle	0	2/2	0	0	0	0	0	2/2
Foot	0	0	0	0	1/1	0	1/1	0

TLI: Time loss injury

contrast, at the U-17 level, 53.8% of traumatic injuries occurred during training, and the majority were of a non-contact nature and led to time loss. However, these differences were not significant ($p=0.068$). Overuse injuries were almost twice as high during training than match play at the U-17 level. For U-18's, there were only two overuse injuries and both occurred during training. Conversely, at the U-19 level, 57.1% of overuse injuries occurred during matches. Nevertheless, these differences were not statistically significant ($p=0.577$) (Tables 3 and 4).

Injury locations, types and severity did not differ according to player age. Similarly, re-injury rates were not affected by age in terms of medical attention and time loss (Table 2).

Discussion

Epidemiological data regarding injuries in youth football at all levels of play, particularly elite ones, remains limited. To our knowledge, this is the first study to examine injury incidence and the influence of age on injuries occurring during both match play and training at the national youth level.

The incidence of injury in football is variable and influenced by many factors, such as player age, level of play, exercise load, and standard of training.^[12] In international youth football, injury incidences were considerably lower in training than during matches.^[1,3,13] In the present study, match injury incidence was approximately five times higher than during training (48.7 and 10.5 per 1000 hours, respectively). Selected data from previous reports showed injuries per 1000 hours during match play and training as 30.4 and 2.9 for U-19s,^[13] 20.7 to 28.6 and 1.2 to 5.6 for U-17s and 16.3 to 27.8 and 0 to 2.1 for U-19s, respectively,^[3] in UEFA European Championships. However, these studies reported either medical attention or time loss injuries.^[3,13] Using data from FIFA World Championships, only Junge et al.^[1] evaluated medical attention and time loss injury incidences together, and reported injuries per 1000 hours during match play as 51.0 to 88.1 and 20 to 34 for U-17s and as 108.7 to 143.5 and 52 for U-20s, respectively. As these substantially higher injury incidences are sourced from data obtained from matches during top tournaments only, comparison with our results is rather difficult. Further studies with longitudinal design are necessary to clarify the real picture of both medical attention and time loss injuries in youth football.

Traumatic injuries represented 52.3% of all injuries, of which a greater proportion occurred during match play. The tendency towards a greater match-injury rate, mostly related to traumatic mechanism, might

result from the necessity of higher physical, physiological and psychological demands of competition. Overuse injuries and non-contact traumatic injuries accounted for 68.2% of all injuries in our study, with similar previous findings in youth tournaments of 41.2%^[3] to 65.2%.^[13] As the majority of international matches and tournaments are played during high season or shortly after the end of the local season, player tiredness and mental stress are possible contributing factors for these injuries.^[14,15] Hägglund et al. suggested that young players be provided sufficient time for rest and recuperation before an international match or during a tournament.^[3]

In general, the upper leg is reported as the most common injury location and muscle strain the most common injury type in studies on youth football.^[3,11,16] Compatible with these reports, the majority of injuries were to the thigh and hip/groin and muscle strain was the leading injury type in the current study. The majority of muscle injuries and all ligament injuries occurred during training. As expected, most contusions occurred during match play. The reasons for a high number of upper leg strains might be multifactorial; excessive physical forces needed for kicking, accelerations during running, and the predominant use of pelvic muscles rather than core abdominal muscle stabilizers.^[17] Furthermore, incomplete muscular development and limited shock absorption of developing muscles in adolescents is a major concern.^[8]

Re-injuries constitute 7 to 42% of all documented injuries in seniors^[11,18-21] and 3 to 9% of the entire injuries in youth players.^[3,8,13] Previous injury and inadequate rehabilitation or early return to play have been hypothesized as risk factors for recurrence.^[22,23] In this study, re-injury frequency was approximately 25%, with most re-injuries early ones. All re-injuries were due to overuse and tended to be more common during training. The considerably higher re-injury percentage may reflect the high demands of intensive training and matches at the national youth level or may result from misreporting of enthusiastic players during the selection process. These could indicate the existing pressures on young players in participating in national football teams and the necessity of coach education and player compliance.

The effect of an injury can be considered in relation to its severity and the number of training days or competitive matches missed.^[21] In this study, 65.9% of all injuries led to time loss and frequently resulted in absence from football for one week or less. Additionally, the majority of moderate injuries and one severe injury occurred during matches. These findings were in accordance with results obtained from UEFA U-17 and U-19

tournaments.^[3] Most traumatic match injuries led to time loss. Additionally, traumatic mechanism was the most common cause of time loss injuries. This may strengthen the idea of the dominance of traumatic match injury in the etiology of time loss. In contrast to previous study results,^[3,24,25] re-injuries tended to cause less absence than new injuries. However, the small number of re-injuries makes comparison difficult.

It has been suggested that the possible relation between the level of maturation and risk for injury should be taken into consideration in the injury profile of youth football players.^[2,8,26,27] The increasing match and decreasing training injury incidences with age in the current report corroborates previous reports.^[2,28-31] Players might still be deficient in injury-avoidance skills and experience less intensive training at younger ages as the intensity of competition increases as players age.^[2]

The distribution of traumatic and overuse injuries were similar across the age groups. All traumatic injuries occurred mostly during matches with player contact at the U-18 and U-19 levels. In contrast, 53.8% of traumatic injuries occurred in training, were mostly non-contact in nature and led to time loss at the U-17 level. The presence of more traumatic mechanisms may be due to the increased energy of impact between players during competition with age. Despite the insignificant differences among the groups, overuse injuries were two times higher in trainings at the U-17 level. These injuries in less-experienced, younger players may result from excessive training and weaknesses in technical and tactical ability as well as in muscle strength, endurance and coordination.^[2,32]

The pattern of injury location was unaffected by age. This finding was in accordance with previous reports^[2,33] and may suggest a common feature of football at the youth level.^[2] Player age was not a contributing factor to injury type. However, muscle injuries were the most common injury type at the U-17 and U-19 levels. In the U-17 and U-18 teams, injuries occurred mostly during training while 62.5% of them occurred during matches in the U-19 team.

Time loss injury rates also seemed to be unaffected by player age. However, they comprised 72% of all injuries at the U-17 level and most were seen during training. Conversely, a greater proportion of injuries occurred during match play and most of them led to time loss at the U-19 level.

Although the ratio of moderate-to-severe injuries were higher at the U-19 level than the U-18 and U-17 levels, differences were not significant. This is contrary to the idea that older elite players are more susceptible

to serious injuries during competition. Re-injury rates were also not affected by player age in terms of medical attention and time loss.

Advantages of the current study include the recording of individual exposure and injuries during both training and match play and the following of injured players to the final day of rehabilitation by the same team physician. Since both medical attention and time loss injury definitions were used, only undeclared complaints may have been omitted. However, the rotation of players in and out of the national teams, the relatively small number of injuries and the possible differences in the maturity status of players of the same chronological age are limitations of this study, reducing the applicability of its results.

In conclusion, increasing match and decreasing training injury incidences with increasing age suggest that player age has an effect on injury incidences with respect to match or training exposure. Increases in match injuries and a tendency towards more traumatic mechanisms with age might be due to higher intensity of play and physical demand. In contrast, greater incidence of overuse injury during training in younger players makes it necessary for the adoption of a cautious approach towards training intensity, technical and tactical abilities, as well as development of muscle strength, endurance and coordination. More data is necessary to analyze the consequences of age effect on the injury profile in youth football.

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References

1. Junge A, Dvorak J, Graf-Baumann T, Peterson L. Football injuries during FIFA tournaments and the Olympic Games, 1998-2001: development and implementation of an injury-reporting system. Am J Sports Med 2004;32:80S-9S.
2. Le Gall F, Carling C, Reilly T, Vandewalle H, Church J, Rochcongar P. Incidence of injuries in elite French youth soccer players: a 10-season study. Am J Sports Med 2006; 34:928-38.
3. Hägglund M, Waldén M, Ekstrand J. UEFA injury study – an injury audit of European Championships 2006 to 2008. Br J Sports Med 2009;43:483-9.
4. Junge A, Dvorak J. Influence of definition and data collection on the incidence of injuries in football. Am J Sports Med 2000;28:S40-6.
5. Hägglund M, Waldén M, Bahr R, Ekstrand J. Methods for epidemiological study of injuries to professional football players: developing the UEFA model. Br J Sports Med 2005;

- 39:340-6.
6. Fuller CW, Ekstrand J, Junge A, Andersen TE, Bahr R, Dvorak J, et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Br J Sports Med* 2006;40:193-201.
 7. Dvorak J, Junge, A. Football injuries and physical symptoms. A review of the literature. *Am J Sports Med* 2000;28:S3-9.
 8. Price RJ, Hawkins RD, Hulse MA, Hodson A. The football association medical research programme: an audit of injuries in academy youth football. *Br J Sports Med* 2004;38:466-71.
 9. Wekesa M. A one year prospective study of soccer injuries in the 1992-1993 Kenyan national team. *Afr J Health Sci* 1995; 2:392-4.
 10. Ekstrand J, Waldén M, Hägglund M. Risk for injury when playing in a national football team. *Scand J Med Sci Sports* 2004;14:34-8.
 11. Eirale C, Hamilton B, Bisciotti G, Grantham J, Chalabi H. Injury epidemiology in a national football team of the Middle East. *Scand J Med Sci Sports* 2012;22:323-9.
 12. Hägglund M, Waldén M, Ekstrand J. Exposure and injury risk in Swedish elite football: a comparison between seasons 1982 and 2001. *Scand J Med Sci Sports* 2003;13:364-70.
 13. Waldén M, Hägglund M, Ekstrand J. Football injuries during European Championships 2004-2005. *Knee Surg Sports Traumatol Arthrosc* 2007;15:1155-62.
 14. Junge A, Dvorak J, Graf-Baumann T. Football injuries during the World Cup 2002. *Am J Sports Med* 2004;32:23S-7S.
 15. Ekstrand J, Waldén M, Hägglund M. A congested football calendar and the wellbeing of players: correlation between match exposure of European footballers before the World Cup 2002 and their injuries and performances during that World Cup. *Br J Sports Med* 2004;38:493-7.
 16. Hägglund M, Waldén M, Ekstrand J. Injuries among male and female elite football players. *Scand J Med Sci Sports* 2009; 19:819-27.
 17. Hall S. Basic biomechanics. London: McGraw-Hill Publications; 1999.
 18. Nielsen AB, Yde J. Epidemiology and traumatology of injuries in soccer. *Am J Sports Med* 1989;17:803-7.
 19. Arnason A, Gudmundsson A, Dahl HA, Jóhannsson E. Soccer injuries in Iceland. *Scand J Med Sci Sports* 1996;6: 40-5.
 20. Hawkins RD, Fuller CW. A prospective epidemiological study of injuries in four English professional football clubs. *Br J Sports Med* 1999;33:196-203.
 21. Hawkins RD, Hulse MA, Wilkinson C, Hodson A, Gibson M. The association football medical research programme: an audit of injuries in professional football. *Br J Sports Med* 2001; 35:43-7.
 22. Hägglund M, Waldén M, Ekstrand J. Injury incidence and distribution in elite football – a prospective study of the Danish and the Swedish top divisions. *Scand J Med Sci Sports* 2005;15:21-8.
 23. Hägglund M, Waldén M, Ekstrand J. Previous injury as a risk factor for injury in elite football: a prospective study over two consecutive seasons. *Br J Sports Med* 2006;40:767-72.
 24. Waldén M, Hägglund M, Ekstrand J. Injuries in Swedish elite football – a prospective study on injury definitions, risk for injury and injury pattern during 2001. *Scand J Med Sci Sports* 2005;15:118-25.
 25. Ekstrand J, Hägglund M, Waldén M. Injury incidence and injury patterns in professional football: the UEFA injury study. *Br J Sports Med* 2011;45:553-8.
 26. Le Gall F, Carling C, Reilly T. Biological maturity and injury in elite youth football. *Scand J Med Sci Sports* 2007;17:564-72.
 27. Deehan DJ, Bell K, McCaskie AW. Adolescent musculoskeletal injuries in a football academy. *J Bone Joint Surg Br* 2007;89:5-8.
 28. McCarroll JR, Meaney C, Sieber JM. Profile of youth soccer injuries. *Phys Sportsmed* 1984;12:113-7.
 29. Hoff GL, Martin TA. Outdoor and indoor soccer: injuries among youth players. *Am J Sports Med* 1986;14:231-3.
 30. Schmidt-Olsen S, Jørgensen U, Kaalund S, Sørensen J. Injuries among young soccer players. *Am J Sports Med* 1991;19:273-5.
 31. Inklaar H. Soccer injuries. II: aetiology and prevention. *Sports Med* 1994;18:81-93.
 32. Peterson L, Junge A, Chomiak J, Graf-Baumann T, Dvorak J. Incidence of football injuries and complaints in different age groups and skill-level groups. *Am J Sports Med* 2000;28: S51-7.
 33. Inklaar H. Soccer injuries. I: incidence and severity. *Sports Med* 1994;18:55-73.