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Epidemiology of Injuries in Young Spanish Soccer Players According to the Playing Positions

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Abstract

Soccer is a complex sport that involves relatively high risks of injury. The high participation rates in soccer has increased the soccer-related injuries among the youth population. There are different physiological demands between playing positions, however a limited amount of studies about the incidence of injuries in soccer players of differing ages and playing position has been published. The aim of this study was to identify the incidence, type, location and severity of injuries in young Spanish soccer players according to playing position in different age groups. There were 431 participants who were male soccer players between the ages of 7 and 23 and they were studied for a full season. All players were classified according to individual playing position: goalkeepers (GK), external defenders (ED), central defenders (CD), central midfielders (CM), external midfielders (EM) and forwards (FW), and according to age groups: younger than 9 years (U9), younger than 11 years (U11), younger than 13 years (U13), younger than 15 years (U15), younger than 18 years (U18), and younger than 23 years (U23). Frequency of type, location and severity of injuries was different according to age and playing position. Injury incidence demonstrated a growth trend as a function of age. Forwards sustained a significantly greater percentage of injuries compared with goalkeepers, central defenders, external defenders and external midfielders. In conclusion, injuries constitute a health threat and knowledge of the epidemiology of injuries in young soccer players is very important in order to be able to develop appropriate preventive measures according to playing positions and age groups.

Keywords: Incidence of injuries; Rate of injuries; Role position; Soccer; Youth soccer

Introduction

An increase in the physical activity of individuals has many health benefits, but a drawback of this increase is the risk of related injuries [1]. Soccer is considered the most popular sport in the world and his practice covers different social strata and age groups, including children and adolescents, due mainly to the perception on the part of parents that the sport is safe [2-4]. However, the high participation rates in soccer has increased the soccer-related injuries among the youth population [5,6] causing an increase in global health care systems worldwide [7].

Soccer is a complex contact sport that involves relatively high risks and rates of injury. Constant exposure to repetitive actions places the integrity of bodily structures at risk, especially in cases in which growth and maturation are not yet completely developed, such as in childhood and adolescence. However, most investigators studying exposure-related injuries have focused on adult male professional soccer players [2], where it is considered a high-risk sport [3] causing great economic losses [7]. In addition to age and maturity, there are other risk factors such as gender, exercise load, previous injuries, physical fitness levels, level of play and standard of training that are associated with soccer

injuries [7,8].

The time-motion analysis has been well analyzed during competitive match play [9-11]. Soccer is a sport characterized by repeated short sprints, rapid acceleration or deceleration, turning, jumping, kicking, and tackling [12]. The physical demands were also analyzed according to the different positional roles, showing activity profiles and fatigue patterns vary among playing positions [10,11]. This evidence suggests that specific physiological demands exist for different playing positions [10-12], however, match play demand is different in youth team categories, and therefore, the physical and physiological profiles of players differ from those of adult players [12].

Other than the different physiological demands between playing positions, it has been reported that professional soccer players have positional differences with regard incidence of injuries[13]. However, a limited amount of studies about the incidence of injuries in soccer players of differing ages and playing position has been published [14].

The purpose of this study was to identify the incidence, type, location and severity of injuries in young Spanish soccer players according to playing position in different age groups to generate new knowledge to develop appropriate preventive measures specific to each case.

Materials and Methods

Subject

There were 431 participants who were male soccer players between the ages of 7 and 23 and they were studied for a full season. All players had been classified according to individual playing position used in studies [12]: goalkeepers (GK), external defenders (ED), central defenders (CD), central midfielders (CM), external midfielders (EM) and forwards (FW), and according to categories as specified by the Spanish Royal Soccer Federation: younger than 9 years (U9), younger than 11 years (U11), younger than 13 years (U13), younger than 15 years (U15), younger than 18 years (U18), and younger than 23 years (U23) **(Table 1)**.

Category	Position	n	Age	Height (m)	Weight (kg)	BMI (kg/cm^2)
			X- ± SD	X- ± SD	X- ± SD	X- ± SD
U9	GK	6	9.54 ± 0.71	1.36 ± 0.07	31.93 ± 10.98	17.10 ± 3.82
	ED	4	9.78 ± 0.34	1.34 ± 0.03	28.13 ± 2.49	15.68 ± 1.55
	CD	14	9.59 ± 0.63	1.39 ± 0.07	34.36 ± 4.77	17.70 ± 1.89
	CM	11	9.90 ± 0.54	1.38 ± 0.06	34.15 ± 6.25	17.79 ± 2.30
	EM	21	9.46 ± 0.63	1.34 ± 0.05	30.47 ± 5.81	16.87 ± 2.52
	FW	12	9.43 ± 0.49	1.32 ± 0.08	29.02 ± 5.56	16.51 ± 1.49
	Total	68	9.58 ± 0.59	1.36 ± 0.07	31.60 ± 6.30	17.08 ± 2.30
U11	GK	7	11.5 ± ± 0.64	1.46 ± 0.04	37.89 ± 2.60	17.83 ± 0.70
	ED	10	11.5 ± ± 0.66	1.45 ± 0.07	36.37 ± 4.37	17.14 ± 0.83
	CD	19	11.62 ± 0.55	1.48 ± 0.07	41.05 ± 9.73	18.66 ± 3.17
	CM	17	11.77 ± 0.55	1.47 ± 0.08	38.49 ± 5.93	17.85 ± 1.72
	EM	11	11.59 ± 0.62	1.41 ± 0.07	35.20 ± 4.85	17.70 ± 1.34
	FW	16	11.57 ± 0.51	1.45 ± 0.05	38.21 ± 6.42	18.17 ± 2.48
	Total	80	11.63 ± 0.56	1.45 ± 0.07	38.27 ± 6.77	18.00 ± 2.15
U13	GK	11	13.42 ± 0.67	1.64 ± 0.08	52.95 ± 9.26	19.77 ± 3.75
	ED	22	13.43 ± 0.51	1.53 ± 0.08	43.79 ± 7.78	18.61 ± 2.60
	CD	20	13.43 ± 0.56	1.65 ± 0.11	54.07 ± 10.39	19.72 ± 2.10
	CM	20	13.24 ± 0.60	1.56 ± 0.05	47.44 ± 7.53	19.34 ± 2.55
	EM	17	13.59 ± 0.59	1.58 ± 0.10	44.29 ± 7.27	17.74 ± 1.54
	FW	24	13.41 ± 0.60	1.56 ± 0.09	44.08 ± 7.72	17.90 ± 1.98
	Total	114	13.41 ± 0.58	1.58 ± 0.09	47.25 ± 9.13	18.77 ± 2.47

U15	GK	6	15.52 ± 0.59	1.78 ± 0.04	72.77 ± 12.43	22.96 ± 3.43
	ED	11	15.69 ± 0.79	1.67 ± 0.05	54.92 ± 6.45	19.60 ± 1.70
	CD	11	15.84 ± 0.53	1.74 ± 0.07	62.16 ± 7.96	20.54 ± 1.63
	CM	15	15.73 ± 0.57	1.72 ± 0.09	63.39 ± 9.31	21.34 ± 2.51
	EM	11	15.28 ± 0.65	1.60 ± 0.07	50.55 ± 6.89	19.63 ± 2.17
	FW	17	15.45 ± 0.65	1.69 ± 0.10	54.76 ± 9.62	18.97 ± 1.50
	Total	71	15.59 ± 0.64	1.70 ± 0.09	58.62 ± 10.55	20.25 ± 2.34
U18	GK	6	17.64 ± 1.14	1.76 ± 0.03	74.12 ± 6.62	23.98 ± 2.76
	ED	9	17.91 ± 1.05	1.76 ± 0.03	68.09 ± 1.75	22.05 ± 0.72
	CD	13	17.97 ± 0.82	1.78 ± 0.06	69.52 ± 7.18	21.94 ± 1.97
	CM	17	17.92 ± 0.91	1.72 ± 0.09	63.66 ± 8.90	21.47 ± 2.16
	EM	13	17.87 ± 0.66	1.74 ± 0.06	65.43 ± 4.22	21.54 ± 1.60
	FW	11	18.22 ± 1.06	1.74 ± 0.09	67.92 ± 9.62	22.30 ± 2.23
	Total	69	17.94 ± 0.89	1.75 ± 0.07	67.26 ± 7.57	22.00 ± 2.01
U23	GK	2	20.25 ± 0.28	1.86 ± 0.04	76.50 ± 3.54	22.11 ± 0.01
	ED	3	21.50 ± 1.12	1.77 ± 0.06	70.70 ± 3.74	22.48 ± 0.29
	CD	5	21.89 ± 1.68	1.81 ± 0.06	78.78 ± 6.38	24.00 ± 1.21
	CM	5	21.60 ± 1.79	1.76 ± 0.06	68.88 ± 7.13	22.14 ± 1.15
	EM	3	21.25 ± 0.97	1.71 ± 0.08	65.53 ± 7.67	22.44 ± 2.55
	FW	11	21.98 ± 1.10	1.76 ± 0.06	69.40 ± 5.06	22.54 ± 1.83
	Total	29	21.66 ± 1.29	1.77 ± 0.06	71.15 ± 6.77	22.68 ± 1.57

Table 1: Socio-demographic and anthropometric characteristics of the players.

All subjects trained 3-4 times per week in sessions of at least 90 minutes. They also played competitively every weekend in matches that varied according to age (40 minutes for U9, 60 minutes for U11, 70 minutes for U13, 80 minutes for U15, and 90 minutes for U18 and U23). All training sessions and matches took place on second generation synthetic turf.

All participants signed a consent form and received a detailed report regarding the confidentiality of the data according to Organic Law 15/1999, dated December 13th (BOE 14-12-1999). Also, an informed consent form was presented to all the soccer players over 18 years and to the legal guardians of the underage players. An assent of soccer players under 18 was also provided along with parental consent. The participants were free to participate in this study. The study was in accordance with the European University of Atlantic´s Ethics Committee and the latest version of the Declaration of Helsinki.

Procedures

The study took place following the criteria established through the consensus statement on definitions and data collection procedures of injuries for epidemiological research in soccer [15]. These variables were collected by qualified personnel through a questionnaire [3], respecting the criteria proposed by the Orchard Sports Injury Classification System (OSICS) [16,17].

The data were collected through individual interviews, performed by a single interviewer, using a reported condition inquiry addressing the occurrence of injury and its characteristics in the current season [2]. In addition to the information collected in the questionnaire, a weekly interview was performed with the medical services, injured players and the coach or physical trainer [3,2], a pilot study was first conducted to adjust the data acquisition procedures and test the inquiry on a population with similar characteristics to those of the present study, which confirmed the full possibility of use and fit in the proposed methodological design.

According to the consensus statement, the type, location, and severity of the injury were recorded, the latter depending on the time the player was absent from training or competition [2-4,7-9]. Injury severity was classed into 4 subdivisions according to the definition previously used in studies [7,9,13,14]: major (more than 28 days), moderate (7-28 days), mild (4-7 days) and minor (1-3 days).

Statistical analyses

This study used descriptive procedures with no manipulation of variables nor modification of the natural course of events. It was considered a cohort study due to the longitudinal nature of the research design in which the subjects were selected by the independent variables and were followed throughout the season until a response was detected.Results were presented using a descriptive method.

A comparison of proportions was performed using a Chi-

square test of independence (χ^2), with Bonferroni corrections of the P values to determine significant difference between groups. In addition, a Chi-square test for trend was performed for some cases in order to test linear trend within a group. The sample was segmented according to the age groups and the play position before determining that variables did not exhibit normality as the result of a Kolmogorov-Smirnov test. AKruskal-Wallis non-parametric test was conducted to find p in order to determine possible significant differences between categories. Subsequently, in the variables that showed significance, the test was performed for two independent samples of U Mann-Whitney.

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), with significance values set at: $\alpha<0,05$; $\alpha<0,01$ y $\alpha<0,001$.

Results

Total exposure of all the subjects (n=431) was 86,014.78 horas; 75,904.45 hours of training and 10,110.33 hours of competition.The number of training and matches hours per age group was different for the season (Table 2).

Categories	Nº of TS.	Hours of TS	Nº of Comp	Hours of Comp	Hours of exposure per category		
					TS.	Comp.	**Total**
U9	422	633	181	120.67	7492.75	844.67	8337.42
U11	426	639	140	140.00	13290.33	1540.00	14830.33
U13	659	988.5	221	257.83	19681.87	2836.17	22518.03
U15	460	690	141	188.00	12905.75	2068.00	14973.75
U18	443	664.5	125	187.50	16058.92	2062.50	18121.42
U23	144	216	46	69.00	6474.83	759.00	7233.83
Total	2554	-	854	-	75.904.45	10.110.33	86.014.78
Note: TS: Training sessions; Comp.: Competition.							

Table 2: Exposure per category during the season.

The distribution of the percentage of injuries sustained per groups is illustrated in **Figure 1**. There was a growth trend in the percentage of injured players according to the age. However, the percentage of injuries was greater among players from U18 **(Figure 1A)**. When comparing the difference in the total number of injuries between groups, forwards reported a greater frequency of injuries in comparison to the other playing position **(Figure 1B)**.

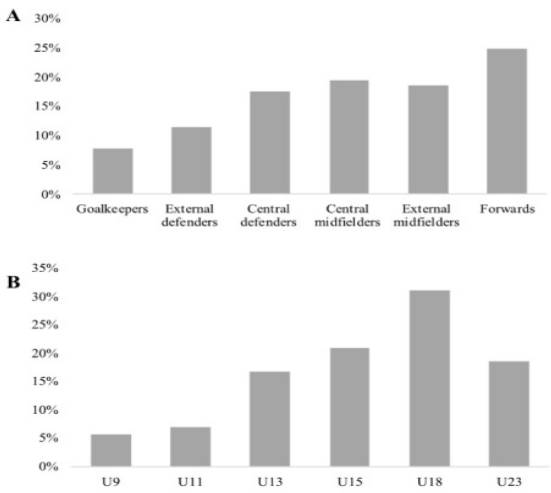

Figure 1: Distribution of injuries according to age groups (A) and playing position (B).

Frequency of injuries was different according to age and playing position. **Table 3** shows the number and percentages of injuries according to individual playing position in all age groups.Goalkeepers from U9 and U11 sustained a greater percentage of injuries. The injuries of external defenders from U23, U18, U15 and U13 were greater compared with U11 and U9. Central defenders from U9 sustained a lower percentage of injuries and central defenders from U13 reported a greater percentage.Percentage of injuries of the external midfielders from U9 was higher compared to the rest. Central midfielders showed a higher percentage of injuries in the U18 group while the older forward (U23) reported more injuries.

Total players		Injuries													
		U9	U11	**U13**	**U15**	**U18**	**U23**	**Total**							
		n	%	n	%	n	%	n	%	n	%	n	%	n	%
GK	38	2	10.5	8	34.8	4	7.3	3	4.3	7	6.9	2	3.3	26	7.9
ED	59	0	0.0	1	4.3	6	10.9	11	15.9	12	11.8	8	13.1	38	11.6
CD	82	1	5.3	3	13.0	16	29.1	11	15.9	19	18.6	8	13.1	58	17.6
CM	85	2	10.5	5	21.7	9	16.4	13	18.8	28	27.5	7	11.5	64	19.5
EM	76	7	36.8	2	8.7	13	23.6	13	18.8	17	16.7	9	14.8	61	18.5
FW	91	7	36.8	4	17.4	7	12.7	18	26.1	19	18.6	27	44.3	82	24.9
Total	431	19	100	23	100	55	100	69	100	102	100	61	100	329	100

Table 3: Injuries according to playing position in the age groups.

Frequency of injuries according to typology was different for each to the age groups and positional roles **(Table 4)**. The majority of observed injuries were muscle-tendinous and joint injuries (47.11% and 34.95% respectively). U9 and U11 sustained a greater percentage of joint injuries, showing the forwards and the goalkeeper as the most affected by this type of injuries respectively. The percentage of bone injuries was greater among players from U13 and central defenders of this category were the most affected players. There was a growth trend in the percentage of muscle-tendinous and joint injuries in the players according to the age. The number of muscle-tendinous injuries was higher in the soccer players from U15, U18 and U23 compared to the players from U9, U11 and U13. Goalkeepers from U15 were the players who had less muscle-tendinous injuries. Midfielders from U18 were the players who reported a greater frequency of muscle-tendinous injuries in comparison to other playing position while joint injuries were more frequent in the external midfielders in this age group. Forwards from U23 reported a higher percentage of muscle-tendinous and joint injuries.

		Typology of injury						
-		**Bone i 0njuries**	**Joint injuries**	**Muscle and tendon injuries**	**Contusion injuries**	**Skin injuries and lacerations**	**CNS and PNS injuries**	**Other injuries**
U9	GK	0	1	0	1	0	0	0
	ED	0	0	0	0	0	0	0
	CD	0	0	0	1	0	0	0
	CM	0	1	1	0	0	0	0
	EM	0	4	1	1	0	0	1
	FW	0	7	0	0	0	0	0
	Total	0	13	2	3	0	0	1
U11	GK	1	4	2	0	0	0	1
	ED	0	1	0	0	0	0	0
	CD	0	1	1	1	0	0	0
	CM	0	2	3	0	0	0	0
	EM	0	2	0	0	0	0	0
	FW	1	3	0	0	0	0	0

	Total	2	13	6	1	0	0	1
U13	GK	1	2	1	0	0	0	0
	ED	2	1	3	0	0	0	0
	CD	4	3	8	1	0	0	0
	CM	1	2	5	0	0	0	1
	EM	2	4	6	1	0	0	0
	FW	1	1	4	1	0	0	0
	Total	11	13	27	3	0	0	1
U15	GK	0	1	1	0	1	0	0
	ED	0	3	8	0	0	0	0
	CD	1	3	7	0	0	0	0
	CM	1	2	8	2	0	0	0
	EM	1	2	8	1	0	0	1
	FW	2	5	8	3	0	0	0
	Total	5	16	40	6	1	0	1
U18	GK	0	5	2	0	0	0	0
	ED	0	4	4	2	2	0	0
	CD	0	7	9	3	0	0	0
	CM	0	5	21	2	0	0	0
	EM	1	10	4	2	0	0	0
	FW	2	7	8	2	0	0	0
	Total	3	38	48	11	2	0	0
U23	GK	0	1	0	1	0	0	0
	ED	0	3	5	0	0	0	0
	CD	1	1	5	0	1	0	0
	CM	0	3	4	0	0	0	0
	EM	0	3	5	1	0	0	0
	FW	2	11	13	0	0	0	1
	Total	3	22	32	2	1	0	1

Table 4: Frequency of the typology of injuries according to playing position for each to the age groups

The majority of injury sites were found in the lower extremities (83.59%). Distribution of the frequency of the location of injuries can be seen in the **Table 5**. Knees and ankles were the joints where most injuries occurred, with variable distribution according to the playing position and the age groups. 63.2% of joint injuries were localized in knees and ankles in soccer players from U9 and forward were the most affected players. 45% of muscle-tendinous injuries were in hip/adductor, front thigh and back thigh in players of U15. In this age group, central defenders were the players with most muscle injuries in hip/adductor while external defenders and forward reported a greater frequency of muscle-tendinous injuries the front thigh. Midfielders from U18 and external midfielders and forwards from U23 sustained a greater number of muscle-tendinous injuries in the back thigh. Forward from U23 reported 55.6% of the joint injuries located in the ankles, central defenders from U18 reported 40% of injuries in the knees and midfielders of this same age group reported 62.5% of muscle-tendinous injuries located in hip/adductor.

Location of injuries																			
		Head / face	Neck / cervical level	Shoulder / clavicle	Arm	Elbow	Wrist	Hand / fingers	Sternum / ribs / dorsal	Abdomen	Lumbar / sacrum / pelvis	Hip / adductor	Front thigh	Back thigh	Knee	Calf	Achilles tendon	Ankle	Foot / hell / toes
U9	GK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0
	EM	0	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	2	0
	FW	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0	0	5	0
	Total	0	0	0	0	0	2	1	2	0	0	0	2	0	3	0	0	9	0
U11	GK	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0	4	0
	ED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CD	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0
	CM	0	0	0	0	1	0	1	0	0	1	2	0	0	0	0	0	0	0
	EM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
	FW	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	Total	0	0	0	1	1	1	1	0	0	2	4	0	0	2	1	0	10	0
U13	GK	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1
	ED	0	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	1	1
	CD	0	1	1	2	0	0	1	0	0	0	2	2	0	2	1	0	3	1
	CM	0	0	0	0	0	0	0	0	1	0	2	0	2	1	0	0	2	1
	EM	0	0	1	1	0	0	0	0	0	0	1	3	1	3	1	0	2	0
	FW	0	0	0	0	0	0	1	0	0	0	1	2	0	2	1	0	0	0
	Total	0	1	2	3	0	2	2	0	1	0	7	9	3	9	3	0	9	4

U15	GK	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
	ED	0	0	0	0	1	0	0	0	0	1	1	3	2	2	0	0	0	1
	CD	0	0	0	0	0	0	0	0	0	1	4	2	1	0	0	0	3	0
	CM	0	0	1	0	0	0	0	0	0	0	2	1	3	3	1	0	2	0
	EM	0	0	0	0	0	1	0	0	1	0	2	1	3	2	1	0	2	0
	FW	0	1	0	0	0	0	0	2	0	1	1	3	2	2	2	0	3	1
	Total	1	1	1	0	1	1	1	2	1	3	10	10	11	9	5	0	10	2
U18	GK	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	3	0
	ED	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	0	5	2
	CD	0	0	0	0	0	0	0	1	0	0	2	2	1	6	1	1	3	2
	CM	0	0	0	0	0	1	0	1	0	1	10	1	5	1	1	0	5	2
	EM	0	0	0	0	2	0	0	0	0	0	0	1	2	3	1	0	7	1
	FW	0	0	1	0	0	2	1	0	0	0	2	3	2	5	0	0	3	0
	Total	0	1	1	0	3	4	1	2	0	3	16	9	10	15	3	1	26	7
U23	GK	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
	ED	0	0	0	0	0	0	0	1	0	0	0	1	1	0	2	0	3	0
	CD	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	1	4
	CM	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	2	1
	EM	0	0	0	0	0	0	0	0	0	0	1	1	4	1	0	0	2	0
	FW	0	0	0	0	0	0	1	0	1	0	4	1	6	1	2	0	10	1
	Total	0	0	0	0	0	0	2	1	1	1	7	4	13	3	5	0	18	6

Table 5: Frequency of the location of injuries according to playing position for each to the age groups

Results showed that 23.10% of injuries were minor, 34.95% were mild, 27.36% were moderate, and 14.59% were severe **(Table 6)**. 52.6% of injuries in U9 were minor and external midfielders and forwards were the most affected players. Goalkeepers from U11 reported more mild and moderate

injuries. External defenders, external midfielders and forwards from U15 were the players who showed most moderate injuries, while central defenders of this group, reported a greater percentage of severe injuries. Midfielders from U18 reported more moderate injuries. Forwards were the players who had most days lost due to injuries.

Severity of injuries					
		Minor	**Mild**	**Moderate**	**Severe**
U9	GK	0	2	0	0
	ED	0	0	0	0
	CD	1	0	0	0
	CM	2	0	0	0
	EM	4	1	1	1
	FW	3	3	1	0
	Total	10	6	2	1
U11	GK	1	3	3	1
	ED	0	1	0	0
	CD	2	1	0	0
	CM	1	3	0	1
	EM	1	0	1	0
	FW	3	0	0	1
	Total	8	8	4	3
U13	GK	0	1	0	3
	ED	2	2	1	1
	CD	1	9	3	3
	CM	1	3	3	2
	EM	1	5	4	3
	FW	4	1	2	0
	Total	9	21	13	12
U15	GK	0	2	1	0
	ED	0	8	3	0
	CD	4	2	0	5
	CM	4	3	6	0
	EM	3	7	0	3
	FW	3	9	4	2
	Total	14	31	14	10
U18	GK	1	5	1	0
	ED	4	3	3	2
	CD	3	4	8	4
	CM	3	9	14	2
	EM	2	5	7	3
	FW	2	7	5	5
	Total	15	33	38	16
U23	GK	1	0	0	1
	ED	4	3	1	0
	CD	4	1	3	0
	CM	1	1	3	2
	EM	3	3	3	0
	FW	7	8	9	3
	Total	20	16	19	6

Table 6: Frequency of the severity of injuries according to playing position for each to the age groups

The 431 soccer players from this study registered a total of 329 injuries in 86,014.78 hours of exposure, with an injury incidence of 3.82 injuries per each 1,000 hours. Injury incidence demonstrated a growth trend as a function of age, showing statistically significant differences between players older than 14 (U15, U18, and U23) **(Figure 2)**. A statistically significant difference in the incidence of injury between goalkeepers and central defenders, external defenders and external midfielders was obtained. Forwards sustained a significantly greater percentage of injuries compared with goalkeepers, central defenders, external defenders and external midfielders **(Table 7)**.

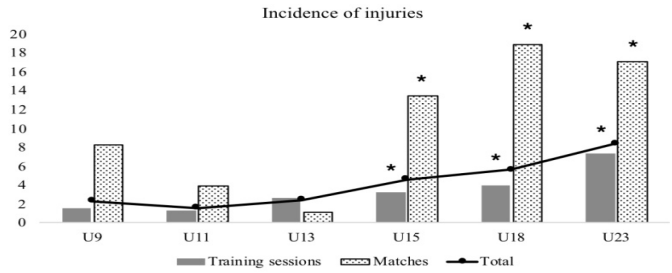

Figure 2: Number of injuries per each 1,000 hours of exposure. *Significant differences with U13, U11 and U9 (p<0,001).

Injury incidence							
	U9	**U11**	**U13**	**U15**	**U18**	**U23**	**Total**
GK	0,24	0,96bce	0,48	0,36	0,84	0,24	3,12
ED	0,00	0,07	0,40	0,74	0,81	0,54	2,56
CD	0,04	0,13	0,71	0,49	0,84	0,36	2,58
CM	0,13	0,33	0,60	0,87	1,87	0,47	4,27
EM	0,39	0,11	0,72	0,72	0,94	0,50	3,37
FW	0,97	0,55	0,97	2,49abce	2,63abc	3,73abcde	11,34abcde
Total	2,28	1,55*	2,44*$	4,61Πφ&$*	5,63Π#&$*	8,43φ#&$*	3,82
Note: A Significant differences with goalkeepers; b Significant differences with external defenders; c Significant differences with central defenders; d Significant differences with central midfielders; e Significant differences with external midfielders; f Significant differences with forwards (p<0,05)							
Π Significant differences with U23; φ Significant differences with U18; #Significant differences with U15; & Significant differences with U13; $ Significant differences with U11; *Significant differences with U9 (p<0,001)							

Table 7: Number of injuries per each 1,000 hours of exposure according to age groups and playing position

There was no significant difference in injury incidence according to frequency, location and severity for each to the positional roles. However, the statistical analysis showed significant differences according to the age group. Table 8 shows that the muscle-tendinous injuries were significantly greater in players from U15, U18, and U23. Players from the older age groups (U18 and U23) showed significant differences in joint injury incidence.

Injury incidence						
Bone injuries Joint injuries	**U9 0abcde 1,56abcde**	**U11 0,13acd 0,88abd**	**U13 0,49bc 0,58abc**	**U15 0,33b 1,07ab**	**U18 0,17a 2,1a**	**U23 0,41 3,04**
Muscle and tendon injuries	0,24abcd	0,41abcd	1,2abc	2,67a	2,65a	4,42
Contusion injuries	0,36b	0,07abc	0,13abc	0,4a	0,61a	0,28
Skin injuries and lacerations	0	0	0	0,07	0,11	0,14
CNS and PNS injuries	0	0	0	0	0	0

Other types of injuries	0,12	0,07	0,04	0,07	0	0,14

Note: A Significant differences with U23; b significant differences with U18; c significant differences with U15; d significant differences with U13; e significant differences with U11; f significant differences with U9 ($p<0.001$).

Table 8: Incidence of injuries according to typology for each of the age groups

Discussion

Injuries constitute a health threat, especially in soccer, where it is considered a high-risk sport [2]. Knowledge of the epidemiology of injuries in young soccer players is very important in order to be able to develop appropriate preventive measures [3]. According to [8] the epidemiologic information provides a composite picture of injury prevalence and incidences and can enable researchers to detect possible susceptibilities to injury in different age groups and across different performance levels. Considering that only 15% of the studies refer to youth soccer [18] and there is very little information about Spanish soccer players, the aim of this study was to describe the epidemiology of injuries inyoung Spanish soccer players according to playing position in of all age groups.

Variations in definitions and methodologies have created differences in the results and conclusions obtained from studies of soccer injuries. This has made interstudy comparisons difficult [15].Thus, the definitions of injury, incidence and severity used in the present study follow those employed in other epidemiologic studies on elite soccer [3,4,6,7,14,15].

The epidemiological variables were collected by qualified personnel through a questionnaire [3], respecting the criteria proposed by OSICS [16,17] as used in other studies [3,7,14]. Soccer seems to be considered a safe sport in young players [19] if the variables and the risks of injury is properly monitored [7,20].

The results from this study show a growth trend in the percentage of injured players according to the age with statistically significant differences in the incidence of injuries in players older than 14 compared to youngers players. This event coincided with other publications [6], however, [7] considered he overall incidence of injury and incidence of training and match injuries in sub-elite youth male soccer players did not increase with age [14,21] compared the age groups, also observed that the injury rate was highest in the youngest. On the other hand, an older study showed that in young players, more injuries occurred in the 14- to 16-year-old players than in the 16 to 18-year-old players [22]. This might be explained by weaknesses in techniques and tactics as well as in muscle strength, endurance, and coordination in the less experienced, younger players. Considering the importance of soccer injuries today, the results found in this study could have benefited from the methodological evolution that Spanish soccer has had in the last years. However, other studies have shown that the injury rate among players aged 16 years or older approaches that of adult players [6] as shown in this study.

Observing the differences found in the incidence of injuries, soccer can be considered a safer sport for players under 12 years of age [6,14] showed a total of 4.8 injuries per 1000 hours of exposure timethrough a cohort study (Prevalence), while our data reported of 3.82 injuries per 1000 hours of exposure time. However, other studies showed a less injuries incidence in youth soccer[7].

Attending to playing position, there are little information about young soccer players and injuries, because most of the studies don't show detailed information between 6-23 years. Specific physiological demands exist for different playing positions [10-12]. According to physiological and tactical demands, it is common to observe that training methods in soccer increasingly require greater specialization. Recent literature has reported that coaches prefer the preparation of their players through the specific methods to maximize training adaptations [21]. In such cases, intensive, specific demands in sports are a potential risk for the occurrence of injuries [7,8]. However, in spite of the distribution of the percentage of injuries was different according to playing position, only goalkeepers from U11 and forwards from U15, U18 and U23 showed significant differences in the injury incidence [23] reported different results of this study, reporting that midfield players and defenders were the most at-risk groups. However, [24] found no difference in injury incidence or injury severity according to playing position.

The percentage of injuries in relation to playing role was relatively consistent across all the age groups and few significant differences were found [24,14] found no significant differences between the role and age group. In spite of various studies have looked at the influence of playing position on injury incidence [13,14], the comparisons are difficult because of differing study design and the fact that youth players may not yet have settled into a definitive positional role [14]. Thus, early specialization through training is more directed towards the specific sport than towards the positional role. The coach chooses tactical strategies and training methodology in the training stages. Each player agrees with the coach on a choice of playing position at the beginning of the season, but this decision can change during the season and players often find themselves playing in a different position. Hence, accurate statistical data analysis and interpretation are not possible [14].

The goalkeepers are the most specialized players because their requirements are different compared to other playing positions. However, in spite of goalkeepers from U9 and U11 reported a higher frequency of injuries, only goalkeepers from U11 showed significant differences in the injury incidence. This difference may suggest that goalkeepers acquire injuries prevention skills as they mature [14].

The results from the present study showed that the total number of injuries sustained per player was greatest in forwards followed by midfielders and external midfielders. Most of the injuries observed were muscular and joint injuries, as other studies showed [2,3,5-8,14,18,22]. Forwards form U9 and goalkeeper from U11 sustained a greater percentage of joint injuries. Age and lack of athletic experience in these players may explain

the frequency of this type of injury, because the joint laxity and diminished neuromuscular control in specific athletic movements could increase the risk of this type of accident [2].

Muscular and tendinous injuries that increased with the age. This result that also occurred in previous research [2,6,7]. Most of muscle-tendinous injuries were in hip/adductor, front thigh and back thigh in players of U15. This finding could be due to growth in muscle and tendon units arises as a response to earlier bone growth, which in turn causes rigidity in muscles and tendons, especially in cases where they cross two joints. Midfielders from U18 and forwards from U23 reported greater number of these injuries and the back thigh was the most affected area. Hamstring strain is the most common single injury in elite soccer [24]. Although previous studies did not find significant results according to age [24,25] showed that there are at least two distinctly different types of acute hamstring strains, one occurring during high-speed running and the other during movements leading to extensive lengthening of the hamstrings.This eventcould be a demonstration that older soccer players show similar epidemiological characteristics to adult players.

Although no difference was found according to playing positions on injuries severity as in other studies [24], results of this study showed that severe injuries were less common in young soccer players compared with adult players [8]. Older players in the training categories suffered a higher percentage of severe injuries, as other studies had previously shown [7]. Goalkeepers from U13 showed more frequency of severe injuries as a result of injuries located in wrist, knee and ankle [14] observed that goalkeepers had significantly more upper body and hand injuries, however, our results showed no significant differences. Midfielders from U18 suffered a higher frequency of moderate injuries and forwards from U18 and U23 reported more severe injuries. This finding could be due to the possible discrepancy between the coach-intended intensity and the actual training intensity perceived by the player in this age groups [26] showed that under 19 players reported a higher intensity and training load than the coach intended.

The U13 goalkeepers showed most severe injuries as result of injuries to the wrist, knee and ankle. For other authors, professional goalkeepers have significantly more upper body and hand injuries compared to outfield players [14,24], however, in this study found no significant difference between the playing position players about this. Midfielders from U18 reported a greater frequency of muscle injuries in comparison to the other playing position. Forwards and midfielders from U23 had more injuries. These results were also observed in other studies [23] and could be in keeping with the view that greater intensity activity and distance covered during the practice are met with a higher risk of musculoskeletal injury.

Conclusion

Therefore, we conclude that the injury ratio is more balanced in elite youth participants [8]. Whereas the epidemiological results reported in youth soccer did not indicate a higher incidence of injury than other youth sports, the results suggested that soccer is a safe physical activity for the youth [4,6,7,19]. Nevertheless, there is agreement on the need to use a surveillance system to monitor the injuries and to understand the magnitude of the problem before undertaking the corresponding preventive strategies [19,23,24]. Age groups and player position influenced the normalized risk of injury. Although many significant differences were not found with respect to the playing position as in other studies, these results reinforce the case for injury prevention training specific position.

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