ΕΡΓΑΣΤΗΡΙΟ
ΝΕΥΡΟΜΗΧΑΝΙΚΗΣ
ΤΕΦΑΑ ΣΕΡΡΩΝ - ΑΠΘ

Επιδημιολογία Μυϊκών Κακώσεων στο Επαγγελματικό Ποδόσφαιρο

ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ
ΤΜΗΜΑ ΦΥΣΙΚΗΣ ΑΓΩΓΗΣ ΚΑΙ ΑΘΛΗΤΙΣΜΟΥ ΣΕΡΡΩΝ

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Αποκατάσταση Αθλητικών Κακώσεων

- Το συνολικό ποσοστό κακώσεων στο επαγγελματικό ποδόσφαιρο εκτιμάται ότι είναι 1000 φορές περισσότερο από οποιαδήποτε άλλο επάγγελμα και παρουσιάζει υψηλό κίνδυνο.

Drawer & Fuller,2002, Ekstrand et al., 2011

Περίπου το 65 – 91% στους άνδρες

Walden et al., 2005

και το 48-70% στις γυναίκες

Faude et al., 2006; Jacobson & Tegner, 2007

Θα παρουσιάσουν τουλάχιστον ένα τραυματισμό κατά τη διάρκεια μιας αγωνιστικής περιόδου.

- Μια επαγγελματική ομάδα με 25 παίκτες μπορεί να παρουσίαση περίπου 50 κακώσεις.

- Αυτό σημαίνει ότι κατά μέσο όρο, το 12% της ομάδας δεν θα είναι διαθέσιμο σε μια αγωνιστική περίοδο

Ekstrand et al., 2011

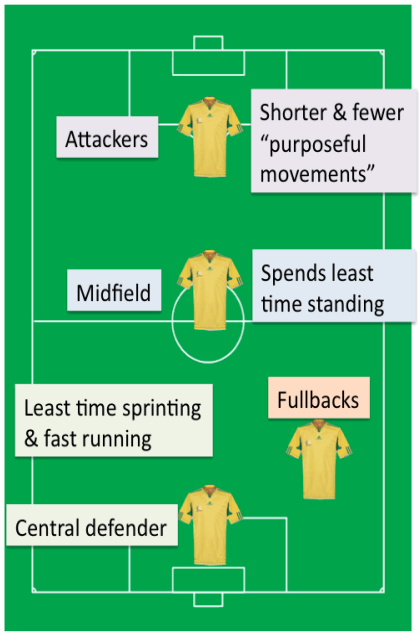
1. α. Οι επαγγελματίες παίκτες πρέπει να βρίσκονται σε συνεχή φυσική, τεχνική, ψυχολογική και φυσιολογική σταθερότητα

   β. Χρονοδιαγράμματα υψηλά που περιλαμβάνουν λιγότερες περιόδους ανάπαυσης μεταξύ προπονήσεων και αγώνων

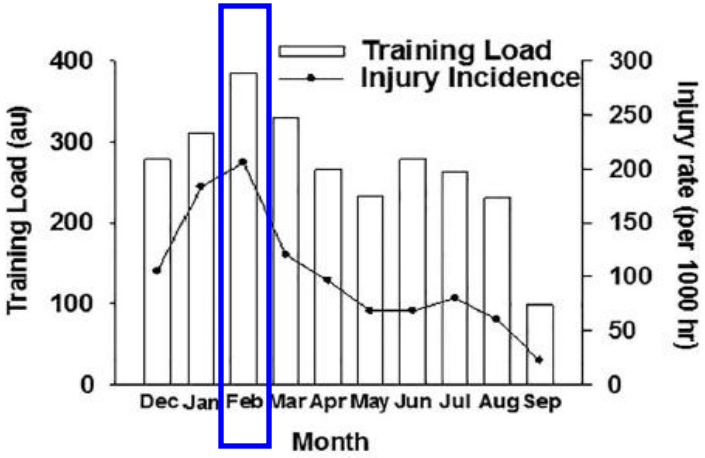
Owen et al., 2011; Dellal et al., 2011

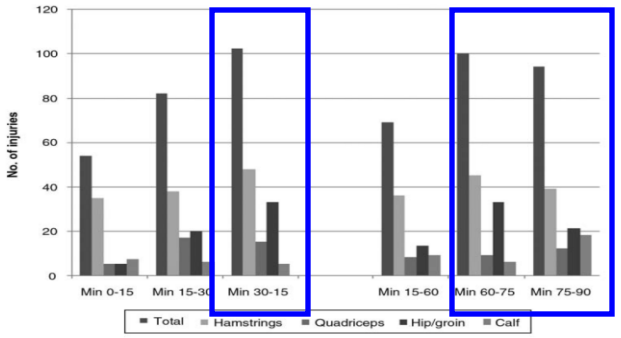
2. Τεράστια οικονομικά οφέλη

Global Sports Salaries Survey 2015



	Distance (km)	Fast run distance (km)	Sprint distance (m)	Tackles made
Attackers	10.48	2.28	690	17
Midfield	11.00	2.23	440	18
Fullbacks	10.98	2.46	640	8
Central defender	9.74	1.69	440	18

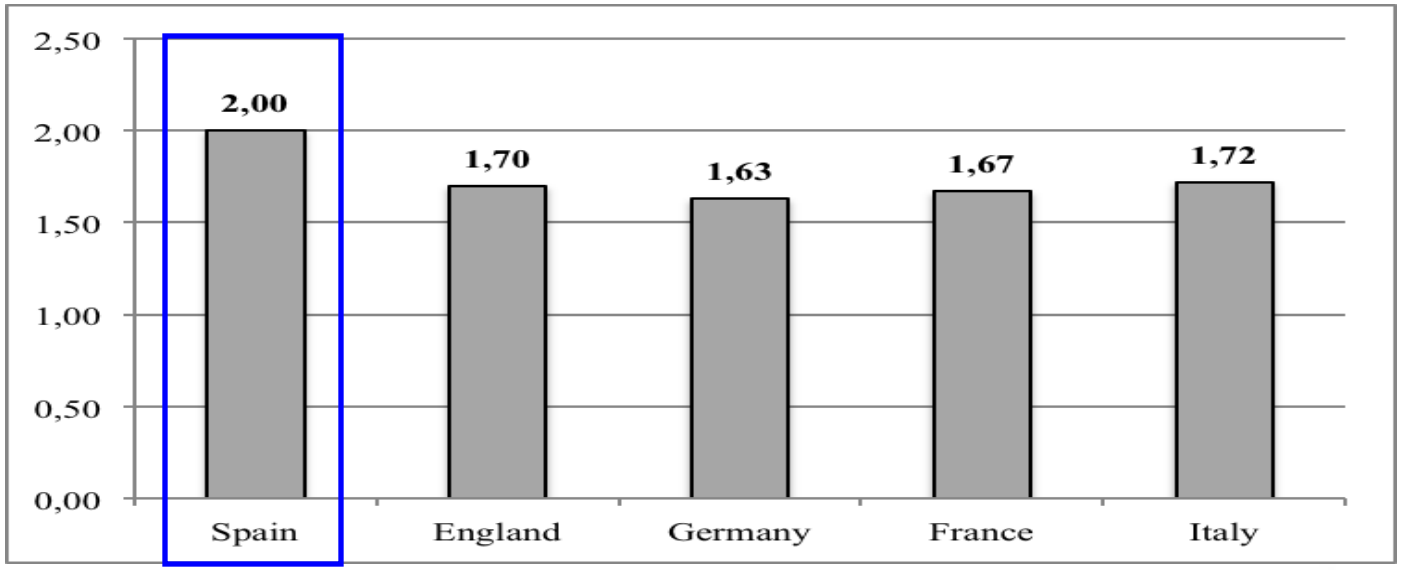




Μεγάλες και απότομες αλλαγές στα προπονητικά φορτία

Orchard, 2012, Cross et al., 2015,Gabbett, 2016

>80, με 1.6 – 2 / εβδομάδα



Dellal et al., 2011; Global Sports Salaries Survey 2015

[Real Madrid CF]

- Σύμφωνα με το πλαίσιο αυτό το σύγχρονο ποδόσφαιρο προδιαθέτει τους παίκτες σε υψηλούς κινδύνους κακώσεων.

- Γιατί δε φαίνεται να υπάρχει το σημείο εκείνο όπου ένας παίκτης να βρίσκεται σε συνεχή φυσιολογική σταθερότητα

ΕΡΓΑΣΤΗΡΙΟ ΝΕΥΡΟΜΗΧΑΝΙΚΗΣ

LEFT VS RIGHT

Table 3 Incidence rates (95 % confidence intervals) of football injuries in different countries

Country/Origin	Study	Total	Training	Match
Denmark[a]	Hagglund et al. [4]	14.4 (9.1, 19.8)	11.8 (6.7, 16.9)	28.2 (17.8, 38.7)
Iceland	Arnason et al. [30]	12.4 (12.1, 12.7)	5.9 (5.7, 6.1)	34.8 (33.6, 36.0)
UEFA CL	Walden et al. [32]	9.4 (9.2, 9.6)	5.8 (5.6, 6.0)	30.5 (29.4, 31.6)
Sweden[a]	Hagglund et al. [4]	8.2 (5.5, 11.0)	6.0 (3.9, 8.2)	26.2 (16.8, 35.5)
Sweden	Hagglund et al. [14]	7.6 (7.1, 8.3)	5.1 (4.6, 5.6)	25.9 (22.8, 29.2)
Kosovo[a]	Present	7.4 (7.1, 7.6)	3.2 (2.7, 3.7)	35.4 (32.0, 39.1)
USA	Morgan et al. [5]	6.2 (n/a)	2.9 (n/a)	35.3 (n/a)
Netherlands[a]	Stubbe et al. [31]	6.2 (5.5, 7.0)	2.8 (2.3, 3.3)	32.8 (28.2, 38.1)
Average ± SD	-	9.0 ± 2.8	5.4 ± 2.7	31.1 ± 3.7

Note: Incidence rates are reported as injuries per 1000 exposure hours. This list is not exhaustive. Data acquisition in studies denoted with [a] has been performed in agreement with the consensus on definitions and data collection procedures in studies of football injuries [22]. *UEFA CL* Union of European Football Associations Champions League. Average ± SD reflect the means and standard deviations of the incidence rates reported in the studies included in this table

Shalay et al., 2016

6.2 - 9.4 κακώσεις / 1000 ώρες έκθεσης

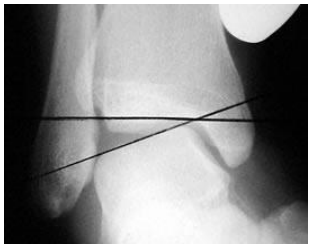
16.6 - 42.0 κακώσεις / 1000 ώρες αγώνων

2.0 - 11.8 κακώσεις / 1000 ώρες προπόνησης

Morgan & Oberlander., 2001; Faude et al., 2009; Hagglund et al., 2009; Ekstrand et al., 2011; 2013; Pfirrmann et al., 2016; Shalay et al., 2016

Επίσης μελέτες αναφέρουν περισσότερες κακώσεις στα κάτω άκρα

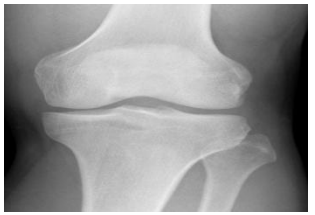
Wong & Hong, 2005



Ιδιαίτερα

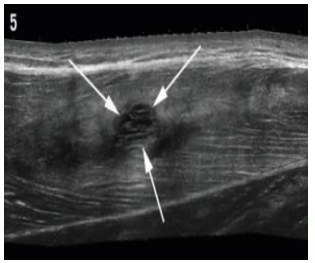
στην ποδοκνημική άρθρωση

στην άρθρωση του γόνατος

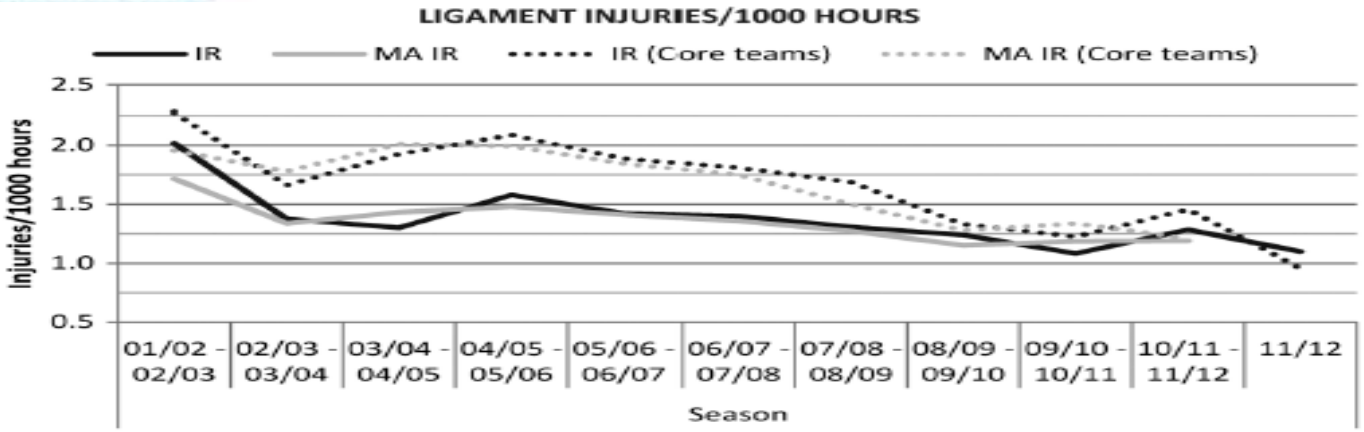


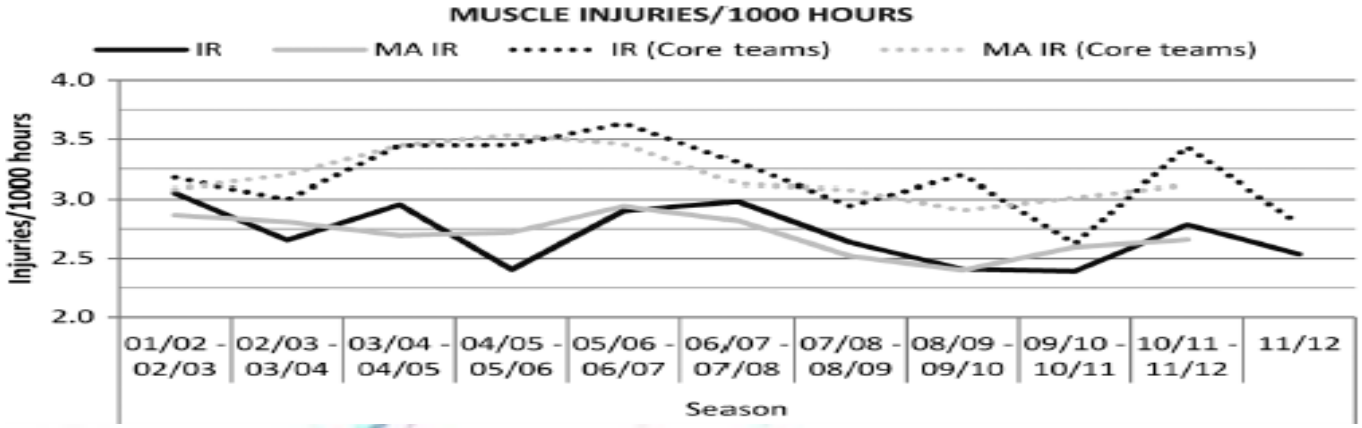
Junge & Dvorak, 2004; Azubuike & Okojie 2009

και στους οπίσθιους μηριαίους



Ekstrand et al., 2013





Ekstrand et al., 2013

PubMed

key: prevention, rehabilitation, injuries, sports, Ankle Sprain, ACL, PCL

ποδοκνημική άρθρωση

↑

1235 (1970-2015)

Πρόσθιο Χιαστό – Οπίσθιο Χιαστό)

↑ ↑

1303 (1977-2015) 236 (1977-2015)

μειωμένα ποσοστά συνδεσμικών κακώσεων μετά την εφαρμογή στρατηγικών προληπτικών μέτρων

Lundblad et al., 2013, Walden et al., 2013; Kerkhofs et al., 2012; Van de Bekerom et al., 2012

PubMed

key: prevention, rehabilitation, injuries, sports, soccer, Hamstring

HMIs

↑

330 (1992-2015)

- και χρειάζεται περαιτέρω επιστημονική έρευνα στην εφαρμογή προγραμμάτων πρόληψης

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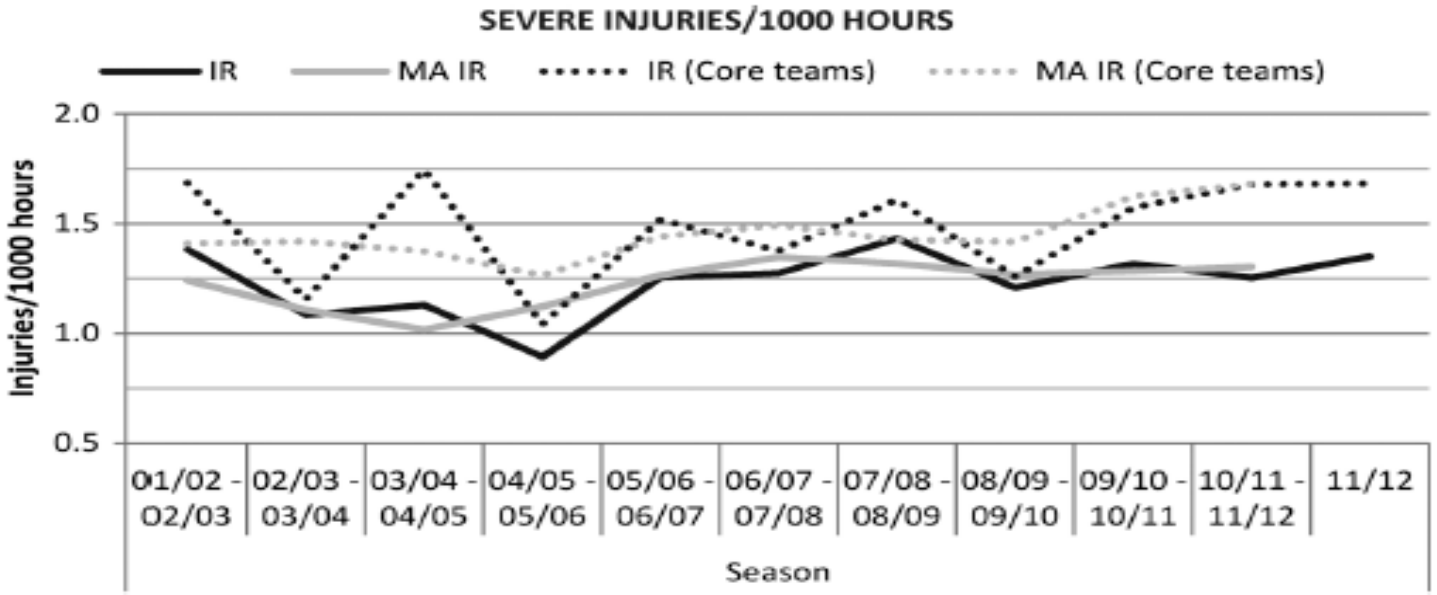

Ekstrand et al., 2013

Table 3 Fifteen most common injuries and their burden

Diagnosis	Injuries (% of all injuries)	Injury rate*	Mean lay-off days±SD	Median lay-off days (IQR)	Injury burden†
Hamstring muscle injury	1025 (12.8)	1.0	19±18	14 (15)	18.2
Adductor injury	742 (9.2)	0.7	15±19	9 (12)	10.3
Ankle sprain, lateral	552 (6.9)	0.5	15±19	8 (14)	7.7
Quadriceps muscle injury	404 (5.0)	0.4	21±22	14 (17.5)	8.1
Calf muscle injury	362 (4.5)	0.3	19±16	15 (17)	6.5
Knee sprain, medial	346 (4.3)	0.3	23±23	16 (23)	7.6
Hamstring hypertonia	224 (2.8)	0.2	7±7	5 (6)	1.5
Knee contusion	213 (2.7)	0.2	5±6	4 (4)	1.1
Thigh contusion	211 (2.6)	0.2	7±9	4 (4)	1.4
Achilles tendinopathy	194 (2.4)	0.2	23±37	10 (20)	4.2
Foot contusion	191 (2.4)	0.2	6±6	4 (4)	1.0
Ankle contusion	182 (2.3)	0.2	6±10	4 (5)	1.1
Low back pain	163 (2.0)	0.2	10±19	5 (5)	1.5
Knee synovitis	148 (1.8)	0.1	14±29	6 (10.5)	2.0
Calf contusion	126 (1.6)	0.1	7±14	4 (5)	0.9

*Injury rate expressed as number of injuries/1000 h.
†Injury burden expressed as number of injury days absent/1000 h.

Ekstrand et al., 2013

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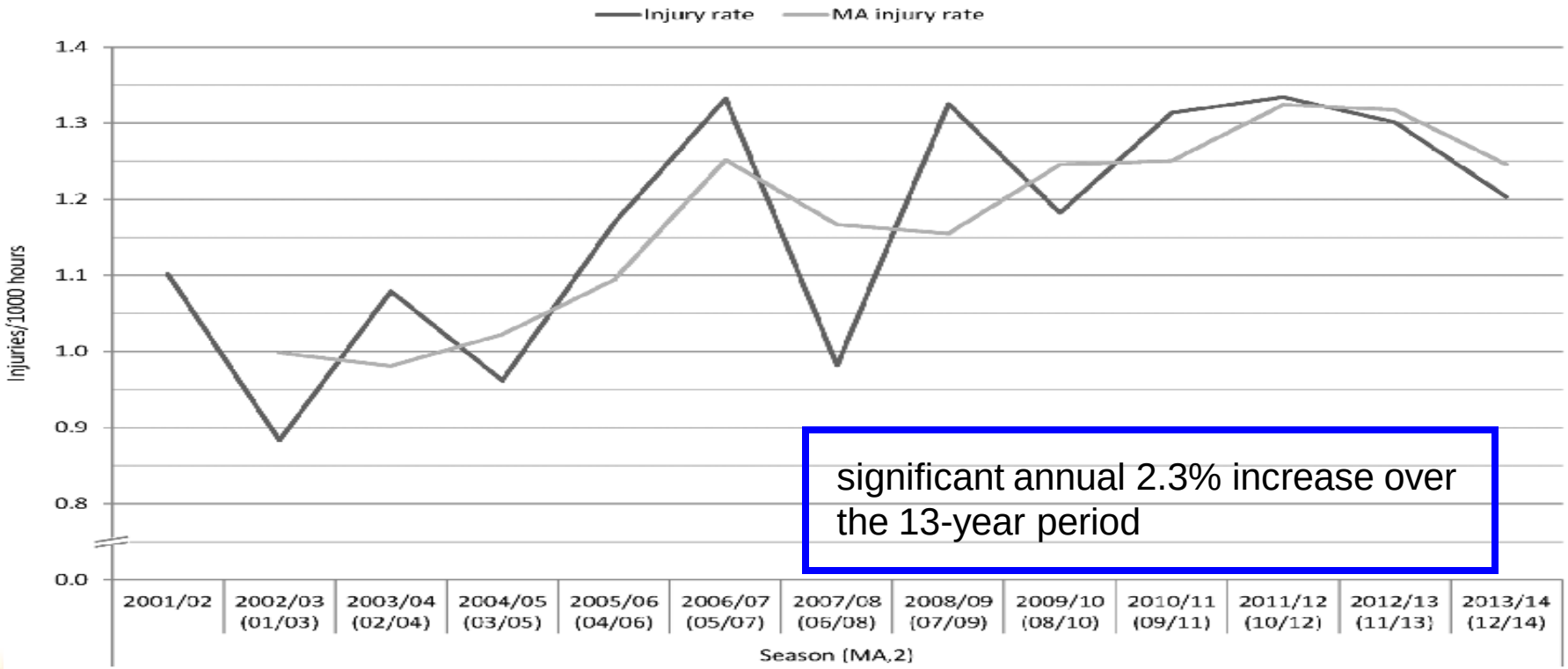

significant annual 2.3% increase over the 13-year period

Ekstrand et al., 2016

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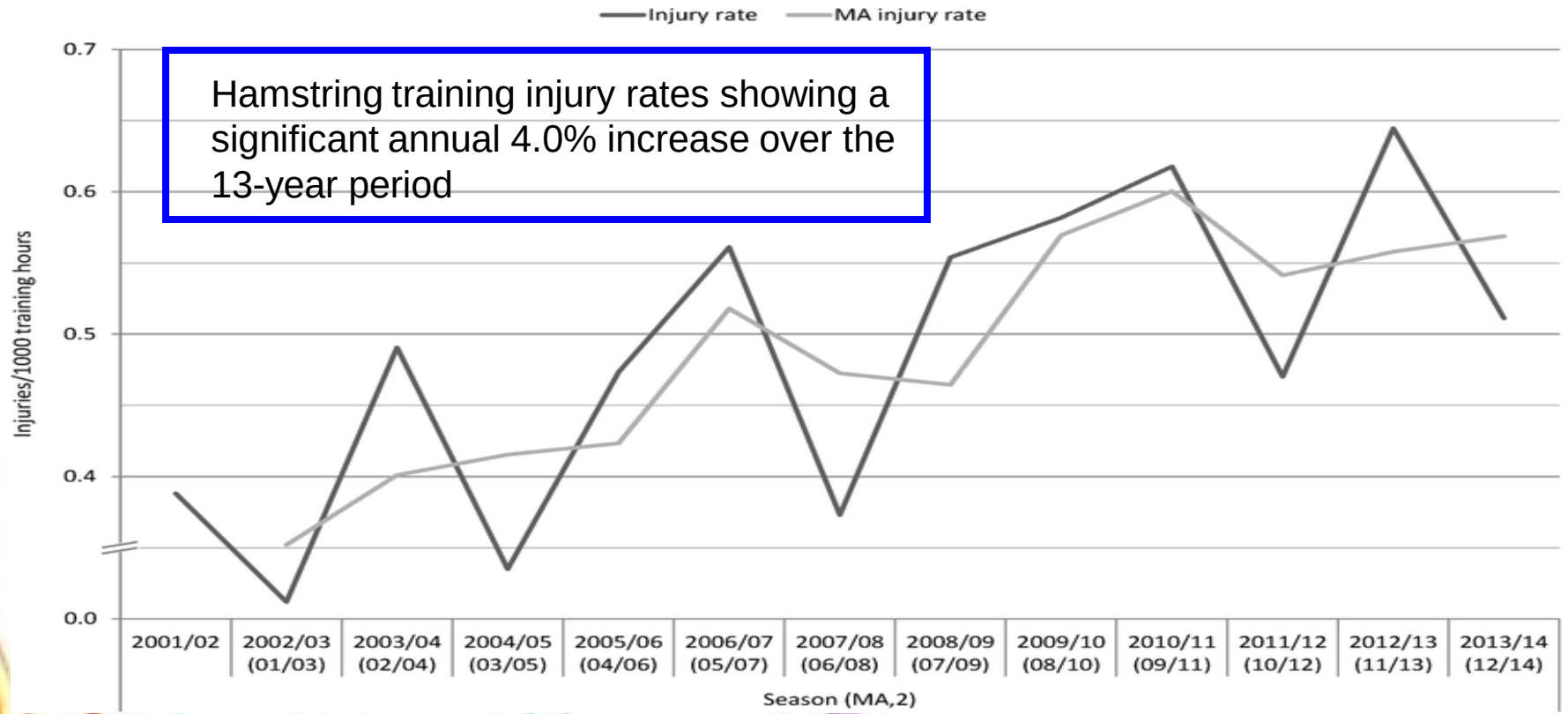

Hamstring training injury rates showing a significant annual 4.0% increase over the 13-year period

Ekstrand et al., 2016

- Οι μυϊκές κακώσεις είναι σήμερα από τα σημαντικότερα προβλήματα που αντιμετωπίζουν οι επαγγελματίες ποδοσφαιριστές και αντιπροσωπεύουν

- 20% - 37% του συνολικού χρόνου απουσίας λόγω τραυματισμού

Arnason et al., 1996, 2004; Hawkins & Fuller 1999; Hawkins et al., 2001; Junge et al., 2004; Walden et al., 2005a,b; Hagglund et al., 2005; Ekstrand et al., 2010; Ekstrand et al., 2011

- Συχνότητα εμφάνισης:
- 2.4 – 4.1 κακώσεις / 1000 ώρες αγώνων
- 0.4 – 0.7 κακώσεις / 1000 ώρες προπόνησης

Ekstrand et al., 2016

Hagglund et al., 2006, 2013; Arnason et al., 2004; Ekstrand et al., 2011, 2013; Walden et al., 2007

- Οπίσθιοι Μηριαίοι
- Πρόσθιοι Μηριαίοι
-
-
- Προσαγωγοί
- Γαστροκνήμιος

Αντιπροσωπεύουν το 90% όλων μυϊκών κακώσεων στους επαγγελματίες ποδοσφαιριστές

Ekstrand et al., 2011

ΝΕΥΡΟΜΗΧΑΝΙΚΗΣ

Epidemiology of Muscle Injuries in Professional Football (Soccer)

- ✓ 31% of all injuries
- ✓ 27%of total injury absence
- ✓ Hamstring 37%
- ✓ Adductor 23%
- ✓ Quadriceps 19%
- ✓ Calf Muscles 13%

AJSM 2011 Jan Ekstrand, MD, PhD*† Martin Hägglund, PT, PhD† arkus Waldén, MD, PhD†

TABLE 4
Consequences of Muscle Injuries During a Season for a Typical 25-Player Squad

	n	Total Absence, d	No. of Missed Matches	No. of Missed Trainings
All muscle injuries	15	223	37	148
Hamstrings	4-6	82	14	55
Quadriceps	2-3	44	8	29
Hip/groin	4	58	9	38
Calf muscles	2	29	5	19

Ekstrand et al., 2011

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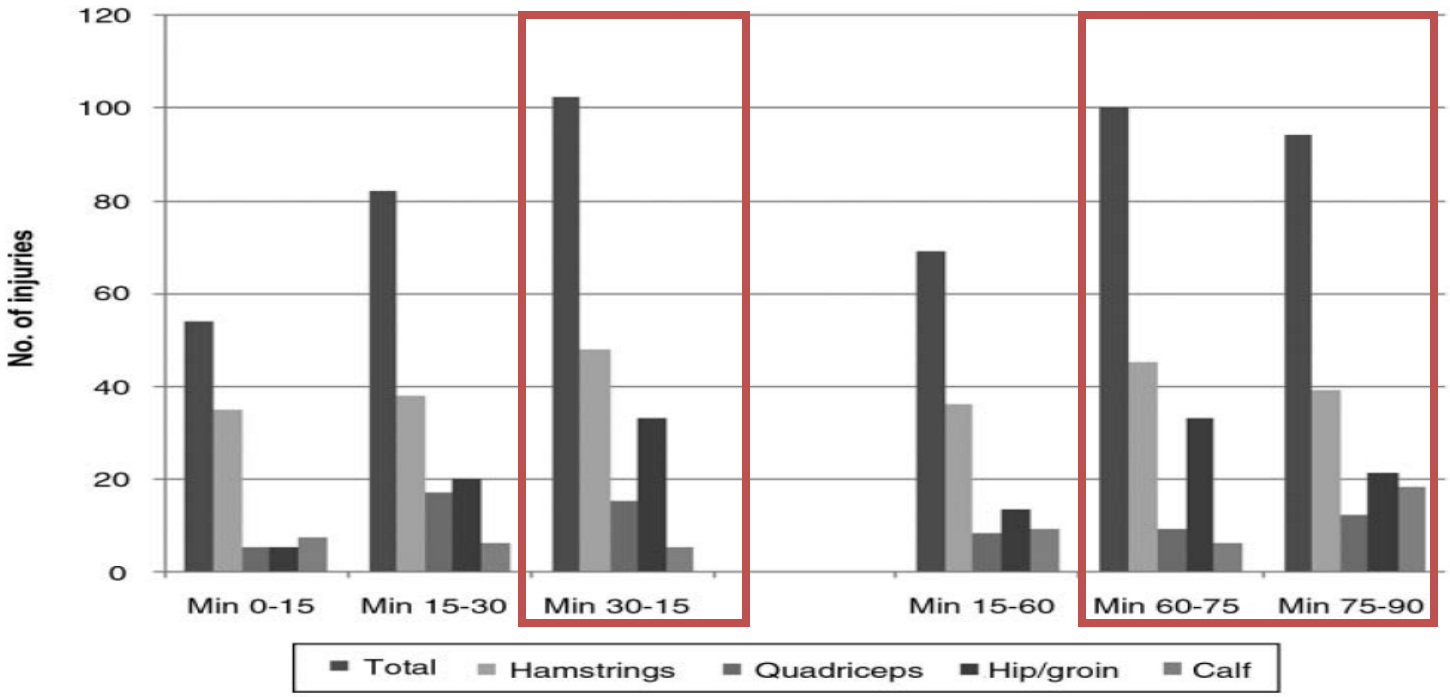
TABLE 2
Incidence, Prevalence, and Nature of 4 Most Common Muscle Injuries

	Hamstrings	Quadriceps	Adductors	Calf Muscles
n (% of total no. of injuries)	1084 (12)	485 (5)	672 (7)	368 (4)
Season prevalence, %	17	8	14	6
Total injury incidence (95% confidence interval)	0.92 (0.87-0.98)	0.41 (0.38-0.45)	0.57 (0.53-0.62)	0.31 (0.28-0.35)
Injury incidence, training[a]	0.43 (0.39-0.47)	0.28 (0.25-0.32)	0.32 (0.29-0.36)	0.18 (0.16-0.21)
Injury incidence, match[a]	3.70 (3.43-3.99)	1.15 (1.00-1.32)	2.00 (1.80-2.22)	1.04 (0.90-1.20)
Injury severity (%)				
Minimal (1-3 days)	140 (13)	60 (12)	119 (18)	50 (14)
Mild (4-7 days)	272 (25)	120 (25)	210 (31)	93 (25)
Moderate (8-28 days)	556 (51)	233 (48)	275 (41)	177 (48)
Severe (>28 days)	116 (11)	72 (15)	68 (10)	48 (13)
Days of absence/injury, mean ± SD	14.3 ± 14.9	16.9 ± 19.2	14.0 ± 24.3	14.7 ± 14.4
Injury burden[b]	13.2 (13.0-13.4)	7.0 (6.8-7.1)	8.0 (7.8-8.2)	4.6 (4.5-4.7)
Reinjuries (%)	174 (16)	81 (17)	124 (18)	48 (13)

[a]Injury incidence for muscle injuries expressed as number of injuries/1000 hours of total exposure (95% confidence interval).
[b]Injury burden expressed as number of days' absence/1000 hours of total exposure (incidence × mean absence) (95% confidence interval).

Ekstrand et al., 2013



Ekstrand et al., 2013

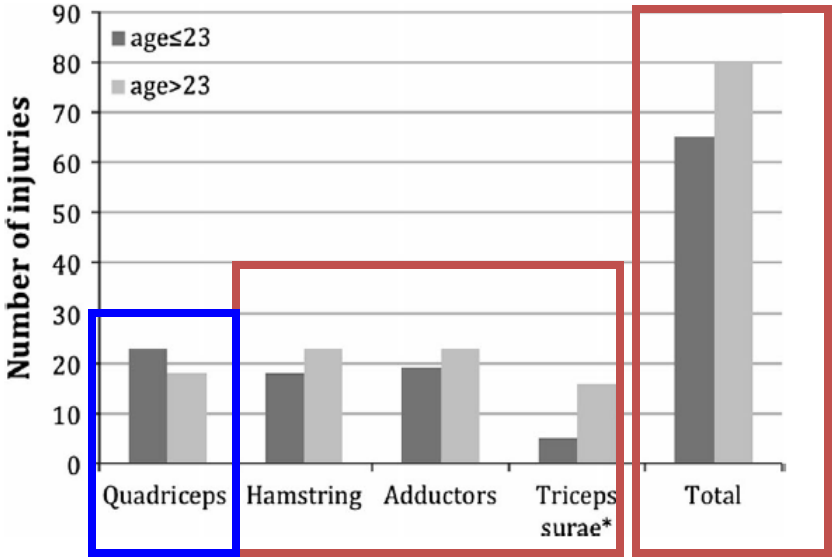


Fig. 1 Age-related injury distribution within the MTU, a comparison between soccer players years or younger and soccer players older than 23 years in terms of injuries primarily affecting either the tendons or the muscles. *MTU* muscle–tendon unit. *Asterisk* denotes significant difference ($p < 0.05$, Chi-square test)

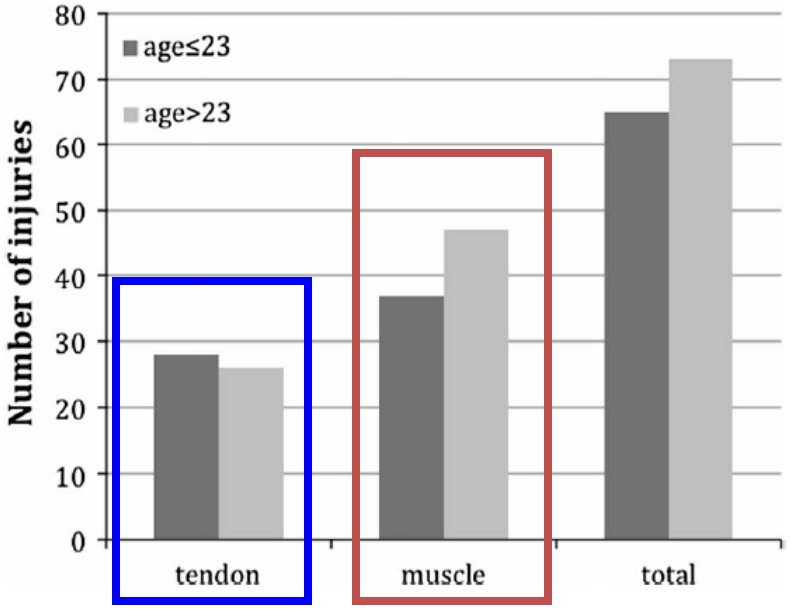


Fig. 2 Age and injury, a comparison of muscle injury distribution of the lower extremity between soccer players 23 years or younger and soccer players older than 23 years

Svensson et al., 2016

Table 3 Volume (cm^3) of structural muscle injuries of the dominant and non-dominant leg for each muscle group

Muscle	*N*	Side	*M*	SD	*p* value
Hip adductors	4	Dominant	1.7	1.3	n.s
	5	Non-dominant	2.6	3.3	
Quadriceps	7	Dominant	6.9	4.6	n.s
	3	Non-dominant	3.4	2.8	
Hamstrings	12	Dominant	2.9	2.8	0.044
	13	Non-dominant	1.4	2.2	
Triceps surae	10	Dominant	2.5	2.0	n.s
	5	Non-dominant	7.1	7.2	

Svensson et al., 2016

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TABLE 1
Nature and Circumstances of Lower Extremity Muscle Injuries in Professional Soccer Players[a]

	Adductors	Hamstrings	Quadriceps	Calf
Injuries	523 (100)	900 (100)	394 (100)	306 (100)
Severity				
Slight/minimal (0-3 d)	76 (15)	105 (12)	49 (12)	41 (13)
Mild (4-7 d)	151 (29)	203 (23)	94 (24)	59 (19)
Moderate (8-28 d)	240 (46)	478 (53)	182 (46)	151 (51)
Severe (>28 d)	56 (11)	114 (13)	69 (18)	51 (17)
Part of season				
Preseason (July-August)	83 (16)	95 (11)	100 (25)	37 (12)
Fall (September-November)	174 (33)	290 (32)	111 (28)	90 (29)
Winter (December-February)	134 (26)	281 (31)	103 (26)	101 (33)
Spring (March-May)	132 (25)	234 (26)	80 (20)	78 (25)
Side				
Right	290 (55)	436 (48)	225 (57)	166 (54)
Left	216 (41)	463 (51)	160 (41)	138 (45)
Bilateral	17 (3)	1 (<1)	9 (2)	2 (1)
Circumstance				
Training	110 (21)	183 (20)	139 (35)	95 (31)
Match	199 (38)	433 (48)	117 (30)	119 (39)
Gradual onset	214 (41)	284 (32)	138 (35)	92 (30)
Situation				
Club first team	485 (93)	835 (93)	372 (94)	291 (95)
Club reserve team	11 (2)	20 (2)	10 (3)	2 (1)
National team	27 (5)	45 (5)	12 (3)	13 (4)
Recurrent injury during study	150 (29)	270 (30)	81 (21)	63 (21)
Early recurrence (<2 mo)	75 (14)	118 (13)	49 (12)	36 (12)

[a]Values are expressed as n (%).

Hagglund et al., 2013

Table 1 Number of matches, response rate, severity and incidence of injury in FIFA World Cups

Tournament	France 1998	Korea/Japan 2002	Germany 2006	South Africa 2010	Brazil 2014
Matches (n)	64	64	64	64	64
Response rate	124/128 (97%)	128/128 (100%)	128/128 (100%)	124/128 (97%)	124/128 (97%)
Match hours documented	2046	2112	2112	2046	2046
Injuries (n)	149	171	145	125	104
Injuries per 1000 player hours (95% CI)	72.8 (61.1 to 84.5)	81.0 (68.9 to 93.1)	68.7 (57.5 to 79.9)	61.1 (50.4 to 71.8)	50.8 (41.0 to 60.6)
Injuries per match (95% CI)	2.40 (2.01 to 2.79)	2.67 (2.27 to 3.07)	2.27 (1.90 to 2.64)	2.02 (1.67 to 2.37)	1.68 (1.36 to 2.00)
Estimated duration of absence from sport (days)					
0		53 (33%)	39 (30%)	39 (35%)	41 (43%)
1–3		59 (37%)	43 (33%)	59 (49%)	15 (16%)
4–7		27 (17%)	19 (15%)	9 (7%)	15 (16%)
8–28		18 (11%)	23 (18)	3 (3%)	16 (17%)
29 and more		3 (2%)	7 (5%)	2 (2%)	8 (8%)
Not specified		0	5	9	6
Missing		11	9	4	3
Injuries with subsequent absence		107	97	82	60
Injuries per 1000 h (95% CI)		50.7 (41.1 to 60.3)	45.9 (36.8 to 55.0)	40.1 (31.4 to 48.8)	29.3 (21.9 to 36.7)
Injuries per match (95% CI)		1.67 (1.35 to 1.99)	1.51 (1.20 to 1.80)	1.29 (1.01 to 1.57)	0.97 (0.72 to 1.22)

Junge & Dvorak., 2016

Table 2 Location, type and mechanism of injury in FIFA World Cups

Tournament	France 1998	Korea/Japan 2002	Germany 2006	South Africa 2010	Brazil 2014
Injured body part					
Head, face, neck	16 (15%)	25 (15%)	13 (9%)	13 (10%)	19 (18%)
Upper extremity, including shoulder	9 (9%)	8 (5%)	12 (8%)	12 (10%)	10 (10%)
Trunk	9 (9%)	6 (4%)	15 (10%)	8 (6%)	7 (7%)
Hip/groin	2 (2%)	11 (6%)	7 (5%)	6 (5%)	4 (4%)
Thigh	21 (20%)	30 (18%)	21 (14%)	36 (29%)	26 (25%)
Knee	24 (23%)	22 (13%)	17 (12%)	9 (7%)	12 (12%)
Lower leg	6 (6%)	29 (17%)	30 (21%)	19 (15%)	13 (12%)
Ankle	13 (13%)	25 (15%)	24 (17%)	15 (12%)	10 (10%)
Foot	5 (5%)	14 (8%)	6 (4%)	7 (6%)	2 (2%)
Total	105	170	145*	125	104
Missing/unclear	44	1	0	0	0
Type of injury					
Concussion	1 (1%)	4 (2%)	1 (1%)	1 (1%)	5 (5%)
Fracture	3 (4%)	3 (2%)	1 (1%)	4 (3%)	6 (6%)
Tendon or ligament rupture/meniscus lesion	2 (2%)	1 (1%)	5 (3%)	1 (1%)	4 (4%)
Sprain (dislocation)	10 (12%)	24 (14%)	24 (15%)	15 (12%)	8 (8%)
Strain/muscle fibre rupture	19 (23%)	35 (21%)	20 (14%)	21 (17%)	25 (24%)
Contusion	34 (41%)	84 (50%)	74 (51%)	53 (43%)	39 (38%)
Laceration/abrasion/blister	6 (7%)	12 (7%)	6 (4%)	9 (7%)	10 (10%)
Others	8 (10%)	6 (2%)	14 (10%)	20 (16%)	6 (6%)
Total	83	169	145	124	103

UEFA Champions League	**Vs**	FIFA World Cups
• **8 -29 days**		1 – 7 days
• Contusion = 21%		**Contusion = 47%**
• **Strain - Rupture = 61%**		Strain – Rupture = 18%

1. Χρονική Διάρκεια της Κάκωσης

2. Τύπο της Κάκωσης

Table 1 Division, playing position, and age distribution of the cohort at the beginning of the study

Division	No	%	Playing position	No	%	Age distribution	No	%
Premier	618	26	Goalkeeper	223	9	17–22	970	41
1st	712	30	Defender	817	34	23–28	817	34
2nd	550	23	Midfielder	739	31	29–34	508	21
3rd	496	21	Forward	597	25	35+	81	3
Total*	2376	100		2376	99		2376	99

*Percentage totals may be subject to rounding errors associated with individual components.

Table 2 Classification of hamstring injuries

Nature of injury	No	%
Muscle strain	749	94
Muscle contusion	12	2
Tendonitis	16	2
Muscle rupture	3	1
Other*	5	1
Bursitis	1	0
Not specified	10	1
Total†	796	101

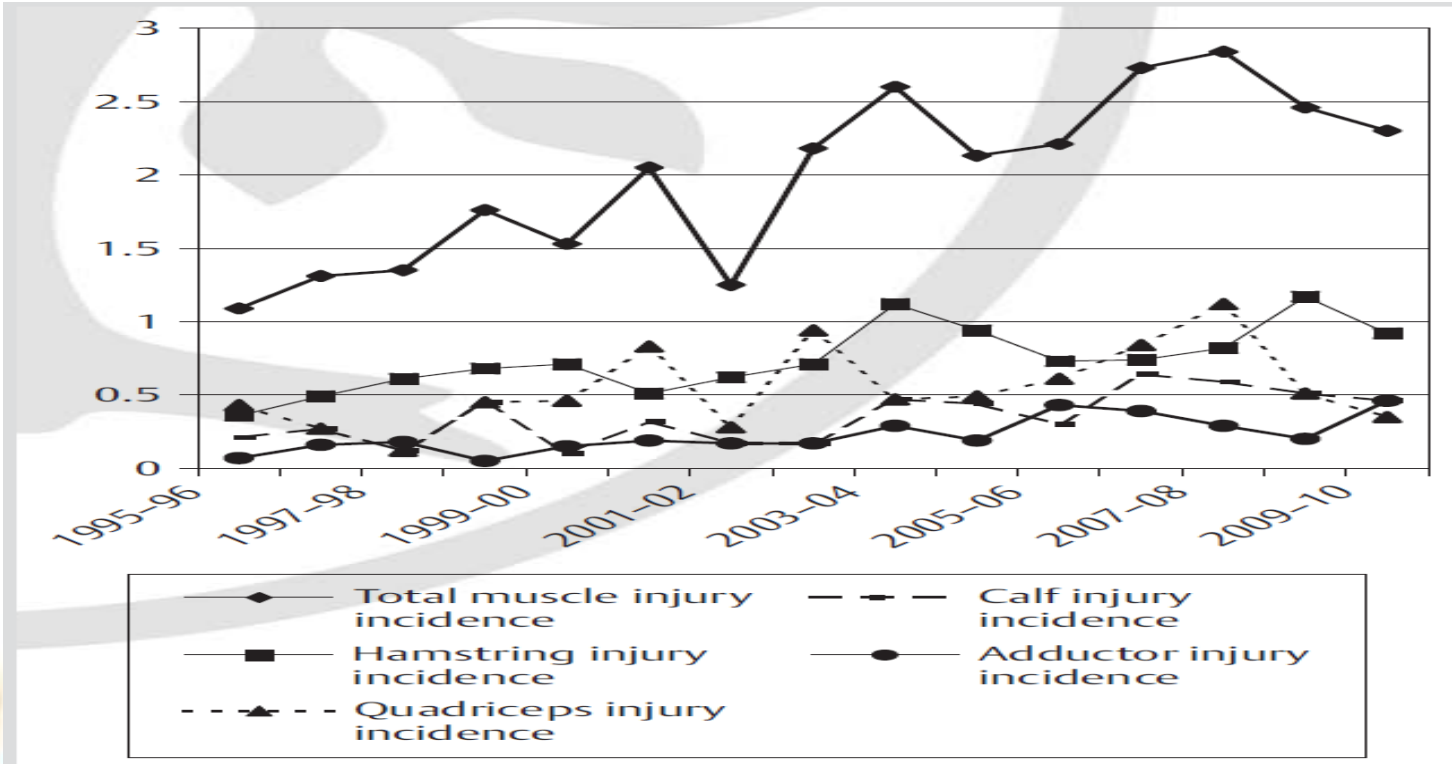
*Other includes cut, overuse, soft tissue bruising and bursitis.
†Percentage totals may be subject to rounding errors associated with individual components.

Table 3 Location of hamstring strain injuries

Muscle	No	%
Biceps femoris	396	53
Unspecified	139	19
Semitendinosus	116	16
Semimembranosus	98	13
Total*	749	101

*Percentage totals may be subject to rounding errors associated with individual components.

Woods et al., 2004



Dauty et al., 2011

Table 4. Most Common Injury Subtype and Diagnosis[a] Extended on Next Page

	Overall						Training	
	2008–2009		2009–2010				2008–2009	
Injury Type/Diagnosis	No.	Incidence	No.	Incidence	IRR	*P*	No.	Incidence
Muscle strain/injury	53	2.07 (1.58, 2.71)	45	1.98 (1.48, 2.65)	0.95 (0.64, 1.42)	.82	21	0.9 (0.60, 1.41
Sprain/joint injury	41	1.60 (1.18, 2.18)	44	1.93 (1.44, 2.60)	1.05 (0.69, 1.60)	.83	16	0.7 (0.43, 1.14)
Groin injury	5	0.20 (0.08, 0.47)	7	0.31 (0.15, 0.65)	1.57 (0.50, 4.96)	.44	1	0.04 (0.01, 0.31)
Hamstrings injury	21	0.82 (0.54, 1.26)	20	0.88 (0.57, 1.36)	1.07 (0.58, 1.98)	.83	6	0.26 (0.12, 0.59)
Knee-ligament injury (including distortion)	12	0.47 (0.27, 0.83)	20	0.88 (0.57, 1.36)	1.87 (0.92, 3.83)	.09	4	0.17 (0.07, 0.47
Anterior cruciate ligament rupture	2	0.08 (0.02, 0.31)	3	0.13 (0.04, 0.41)	1.69 (0.28, 10.1)	.57	2	0.09 (0.02, 0.35)
Ankle sprain (including syndesmosis injury)	21	0.82 (0.54, 1.26)	16	0.7 (0.43, 1.15)	0.86 (0.45, 1.64)	.64	9	0.39 (0.21, 0.76)

Abbreviations: IRR, incidence rate ratio; NA, not applicable.

[a] IRRs compare the 2009–2010 with the 2008–2009 season using the *z* statistic.

Karen aus der Funten et al., 2014

Table 1. Severity, location and type of injury in the 2012/2013 and 2013/2014 seasons of the Serie A.

	Number of injuries	%
Severity (days of absence)		
Minor (4–7 days)	8	2.2
Moderate (8–28 days)	179	49.3
Severe (>28 days)	176	48.5
Body location		
Head	2	0.6
Upper limbs/trunk	17	4.7
Back	13	3.6
Hip/groin	5	1.4
Thigh	152	41.9
Knee	69	19.0
Lower limbs	42	11.6
Ankle	24	6.6
Foot	17	4.7
Other	6	1.7
Not specified	16	4.4
Type		
Ligament injuries/joint	85	23.4
Fracture	24	6.6
Muscle strain	174	47.9
Overuse injuries	50	13.8
Contusion/edema	14	3.9
Not specified	16	4.4
Total	*363*	*100.0*

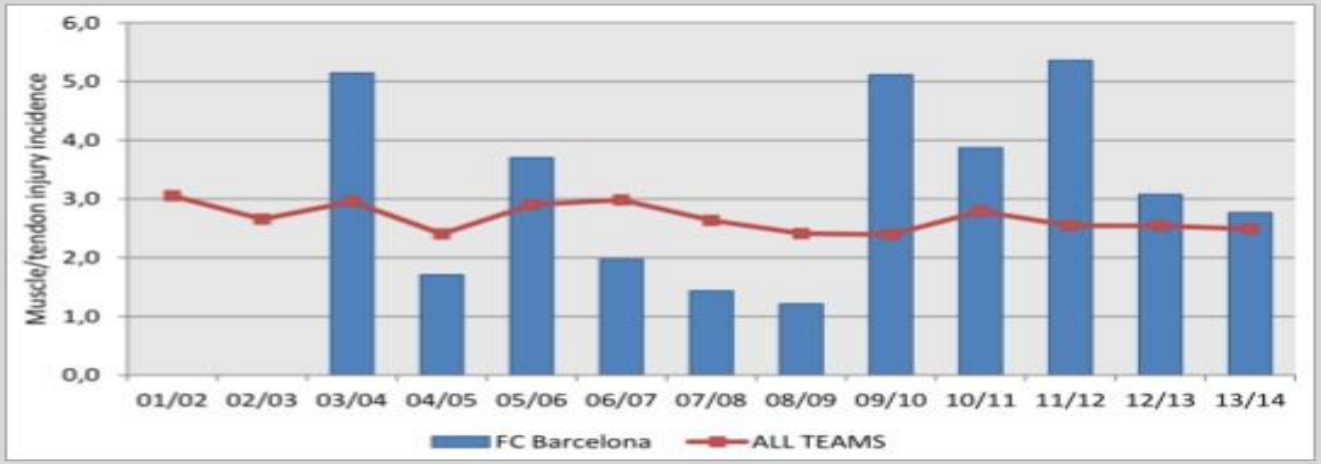
Falese et al., 2016

Table I. Incidence of injuries (by location) in the First Division Spanish Football League.

	All injuries					Competition injuries						Training injuries				
Location of injury	*N*	%	Inc.	95% CI		*N*	%	Inc.	95% CI		*P*	*N*	%	Inc.	95% CI	
Thigh	473	36.6	2.068	1.89	2.263	203	38.7	16.863	14.696	19.35	*	270	35.1	1.246	1.106	1.404
Ankle	185	14.3	0.809	0.7	0.934	64	12.2	5.316	4.161	6.792	*	121	15.7	0.558	0.467	0.667
Hip/groin	175	13.5	0.765	0.66	0.887	73	13.9	6.064	4.821	7.628	*	102	13.3	0.471	0.388	0.571
Knee	147	11.4	0.643	0.547	0.755	59	11.3	4.901	3.797	6.326	*	88	11.4	0.406	0.33	0.5
Lower leg	126	9.7	0.551	0.463	0.656	42	8	3.489	2.578	4.721	*	84	10.9	0.388	0.313	0.48
Foot	53	4.1	0.232	0.177	0.303	25	4.8	2.077	1.403	3.073	*	28	3.6	0.129	0.089	0.187
Lumbar/sacrum/pelvis	39	3	0.17	0.125	0.233	14	2.7	1.163	0.689	1.964	*	25	3.3	0.115	0.078	0.171
Head/face/neck/cervical	35	2.7	0.153	0.11	0.213	21	4	1.744	1.137	2.676	*	14	1.8	0.065	0.038	0.109
Sternum/rib/dorsal	19	1.5	0.083	0.053	0.13	7	1.3	0.581	0.277	1.22	*	12	1.6	0.055	0.031	0.098
Shoulder/clavicle	16	1.2	0.07	0.043	0.114	6	1.1	0.498	0.224	1.109	*	10	1.3	0.046	0.025	0.086
Upper extremities	14	1.1	0.061	0.036	0.103	5	1	0.415	0.173	0.998	*	9	1.2	0.042	0.022	0.08
Abdomen	11	0.9	0.048	0.027	0.087	5	1	0.415	0.173	0.998	*	6	0.8	0.028	0.012	0.062
Total	1293	100	5.653	5.353	5.969	524	100	43.529	39.957	47.42	*	769	100	3.549	3.306	3.808

Notes: Results are shown as frequency (*N*), proportion (%) and incidence (Inc., per 1000 h of exposure). CI, Confidence Intervals.
*$P < 0.05$ between competition and training.

Salces et al., 2014



(UCL Elite Club Injury Study. 2013/2014 Season Report)

1. Why are so important the hamstrings injuries?

Personal cost

Injury rate

Severity of injury

Reinjury risk

Competition

UEFA CHAMPIONS LEAGUE

UEFA Champions League Injury Study

Figure 14. Muscle/tendon strain injury incidence

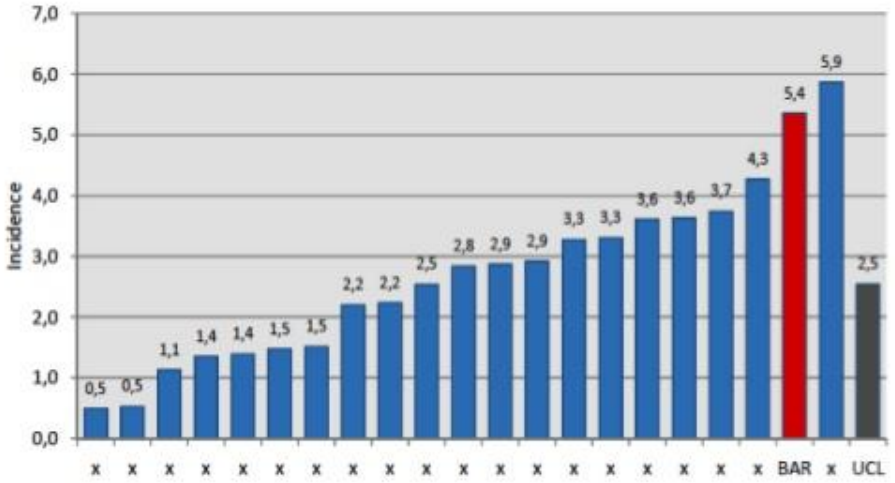
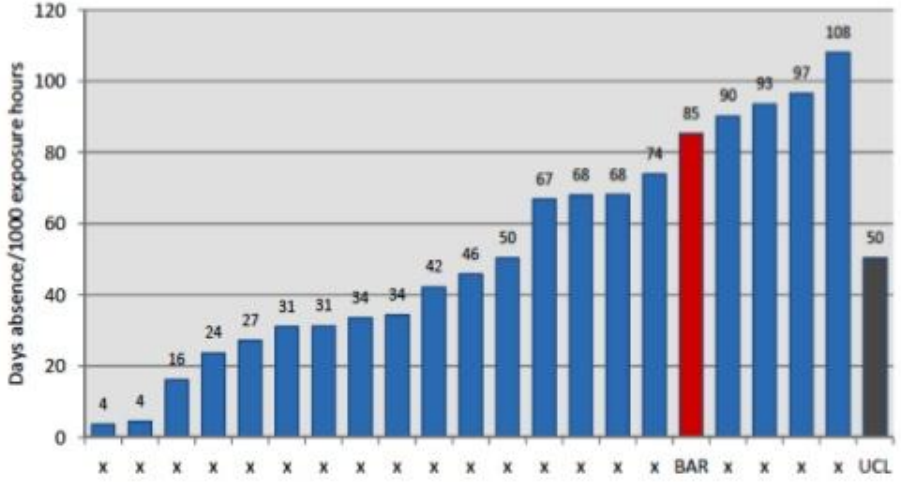


Figure 15. Muscle/tendon injury burden



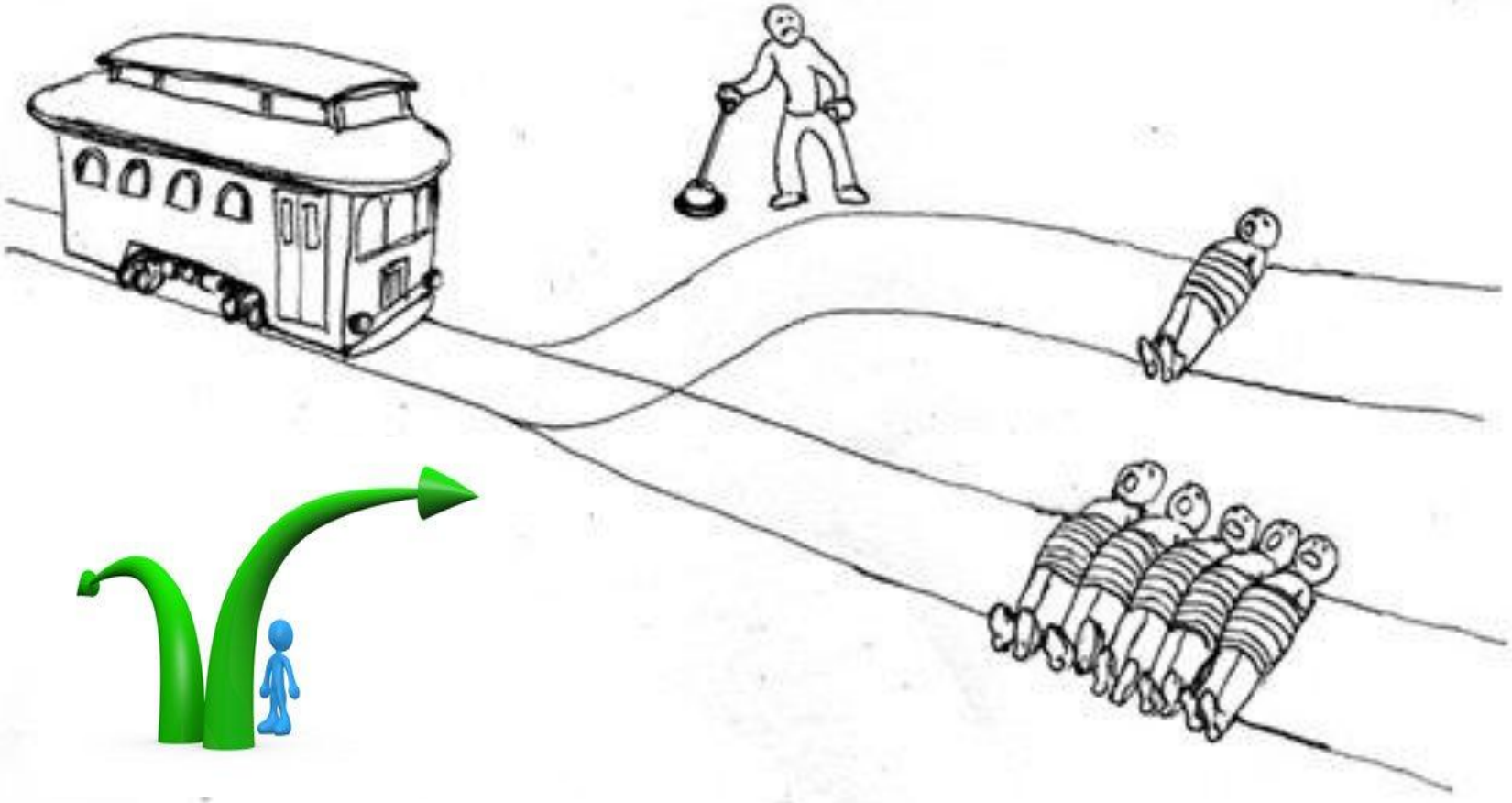
Lionel Messi 64 – 69 αγώνες
2011-2012, 2010 – 2011 και 2009 – 2010

Lionel Messi out for up to eight weeks with hamstring tear

Image above: Lionel Messi touching his right distal hamstrings during the 2013 Champions League quarter of final against Paris Saint Germain.

Lionel Messi Hamstring Injury Fears Raised After Bayer Leverkusen vs. Barcelona

Hamstring strain injuries: are we heading in the right direction?



1ο: Σκεπτικό

- **1. Η μεγάλη συχνότητα των HMIs στους επαγγελματίες ποδοσφαιριστές**

  Ekstrand et al., 2013, 2016

- **2. Τα υψηλά επίπεδα υποτροπής HMIs (16% - 30%)**

  Ekstrand et al., 2011; Elliott et al., 2011; Hagglund et al., 2006; 2009; Petersen et al., 2010

- α. Οι πρώτοι 2 μήνες μετά την επιστροφή, είναι ο υψηλότερος κίνδυνος για υποτροπή **HMI**s (13%)

  Brooks et al., 2006; Orchard et al., 2002; Ekstrand et al., 2011

- β. Και ο κίνδυνος **HMI**s παραμένει σε υψηλά επίπεδα για τουλάχιστο 12 μήνες

  Hagglund et al., 2006; Gabbe et al., 2006; Warren et al., 2010

Current Cause – Effect Model for HSI

Mendiguchia et al., 2011

2ο: Σκεπτικό

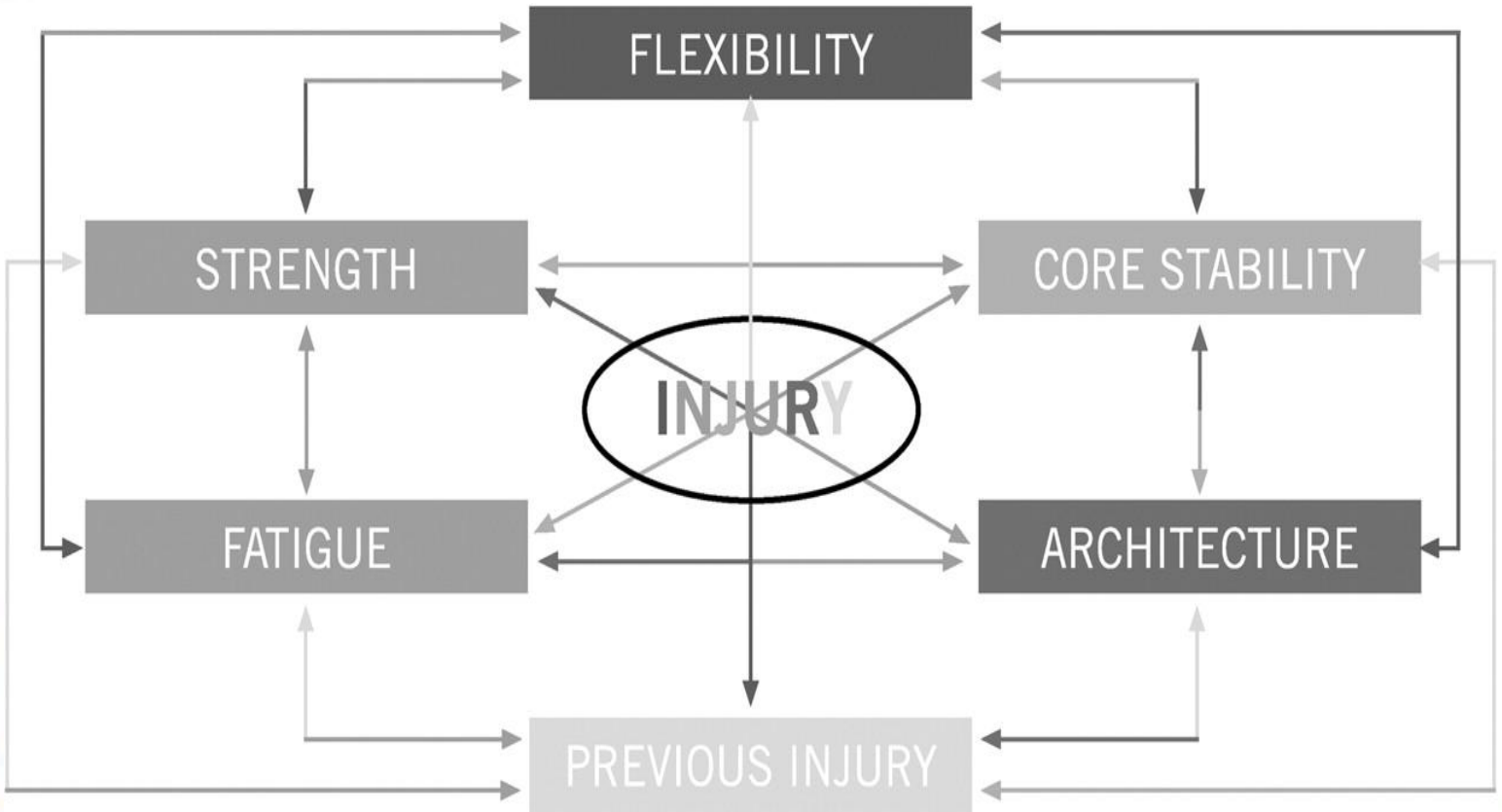
- Η συχνότητα **HMI**s και **HMI**s $_{\textbf{re-injury}}$ δεν έχουν βελτιωθεί κατά την διάρκεια των τελευταίων τριών δεκαετιών

  Hawkins et al., 2001; Junge et al., 2004; Walden et al., 2005a,b; Hagglund et al., 2005; Ekstrand et al., 2010; 2011; 2013

- Οι ερευνητικές μέθοδοι που βασίζονται σε αναλυτικές προσεγγίσεις μονής κατεύθυνσης παραμελούν την **πολυπαραγοντική πάθηση** και την πολυπλοκότητα των **HMI**s

  Mendiguchia et al., 2011

New Conceptual Model for **HMI**s



Πολυπαραγοντική Ανάλυση

Mendiguchia et al., 2011

English Football Association (FA)

Oslo Sports Trauma Research Center

FIFA Medical Assessment and Research Center (F-MARC)

Variation in injury incidence rate reporting: the case for standardization between American and non-American researchers

LCDR George C. Balazs, MD, MC, USN[a], CPT Alaina M. Brelin, MD, MC[a], CPT Jared A. Wolfe, MD, MC[a], CAPT David J. Keblish, MD, MC, USN[b] and CDR John-Paul H. Rue, MD, MC, USN[b]

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TABLE 1. Summary of active large injury surveillance systems

Organization/database	Nationality	Sport(s)	Incidence reporting method(s)
High School Sports-Related Injury Surveillance Study (HSSRISS)	U.S.A.	Multiple	Injuries per 1000 athletic exposures
National Collegiate Athletic Association	U.S.A.	Multiple	Injuries per 1000 athletic exposures
National Football League	U.S.A.	Football	Injuries per 1000 athletic exposures
Australian Football League (AFL)	Australia	Australian football	Injuries per 1000 player hours (match exposure), injuries per 1000 player-weeks (training exposure)
Fédération Internationale de Football Association (FIFA)	International	Soccer	Injuries per match, injuries per 1000 match hours
International Olympic Committee	International	Olympics	Injuries per 1000 athlete participations

Hamstring strain injuries: are we heading in the right direction?

? Medical Assessment and Research Center

Prevention of injury

Injury report form

(Team) Player-ID: Date:

1. **Injured body part**

		right	left	
▫ head / face	▫ shoulder	▫	▫	▫ hip
▫ neck / cervical spine	▫ upper arm	▫	▫	▫ groin
▫ thoracic spine	▫ elbow	▫	▫	▫ m. adductor
▫ lumbar spine	▫ lower arm	▫	▫	▫ hamstrings
▫ sternum / ribs	▫ wrist	▫	▫	▫ m. quadriceps
▫ abdomen	▫ hand	▫	▫	▫ m. abductor
▫ pelvis / sacrum	▫ finger / thumb	▫	▫	▫ thigh
		▫	▫	▫ knee
		▫	▫	▫ lower leg
		▫	▫	▫ achilles tendon
		▫	▫	▫ ankle
		▫	▫	▫ foot
		▫	▫	▫ toe

2. **Type of injury**

▫ concussion with loss of consciousness	▫ rupture of tendon	▫ strain
▫ concussion without loss of consciousness	▫ ligamentous rupture with instability	▫ contusion
▫ fracture	▫ ligamentous rupture without instability	▫ tendonitis / bursitis
▫ dislocation	▫ lesion of meniscus	▫ dental injury
▫ rupture of muscle	▫ sprain	▫ deep wound
		▫ laceration / abrasion
		▫ others

3. **Diagnosis:** _____

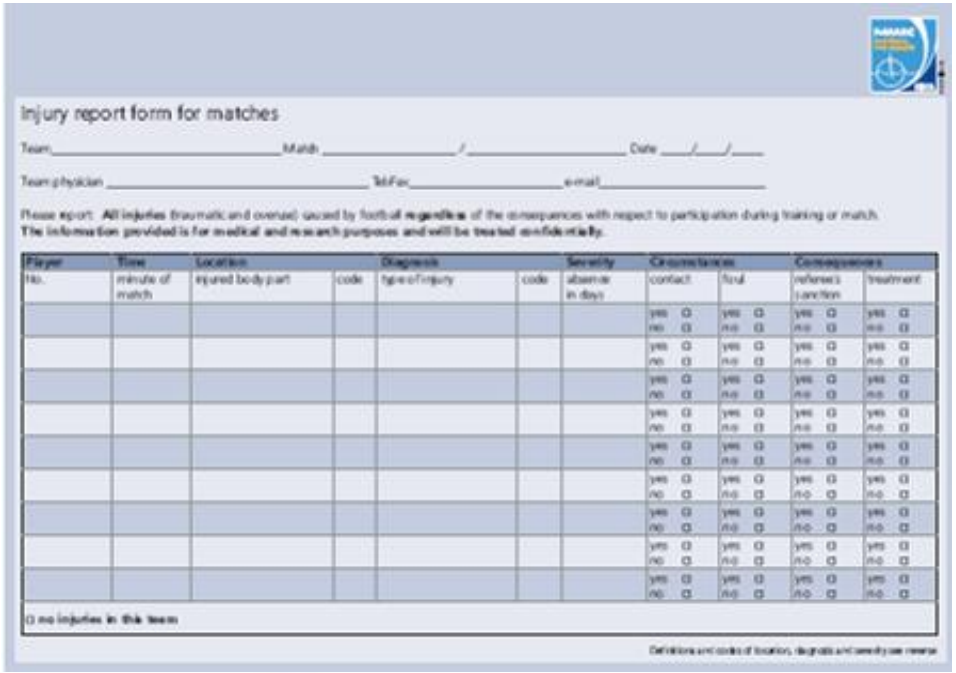
4. Has the player had a **previous injury** of the same location and type?
▫ no ▫ yes, _____ months ago

5. Was the injury caused by **overuse** or **trauma?**
▫ overuse
▫ trauma

6. **When** did the injury occur?
▫ training Date _____
▫ match

7. Was the injury caused by **contact with another player?**
▫ no ▫ yes

8. Approximately **how long** will the player not be able to participate as usual in the training sessions or matches?
Approx. _____ days



Injury report form for matches

Team:_____ Match _____ / _____ Date ____/____/____

Team physician _____ Tel/Fax_____ e-mail_____

Please report: **All injuries** (traumatic and overuse) caused by football **regardless** of the consequences with respect to participation during training or match.
The information provided is for medical and research purposes and will be treated confidentially.

Player	Time	Location		Diagnosis		Severity	Circumstances		Consequences	
No.	minute of match	injured body part	code	type of injury	code	absence in days	contact	foul	referee's sanction	treatment
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫
							yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫	yes ▫ no ▫

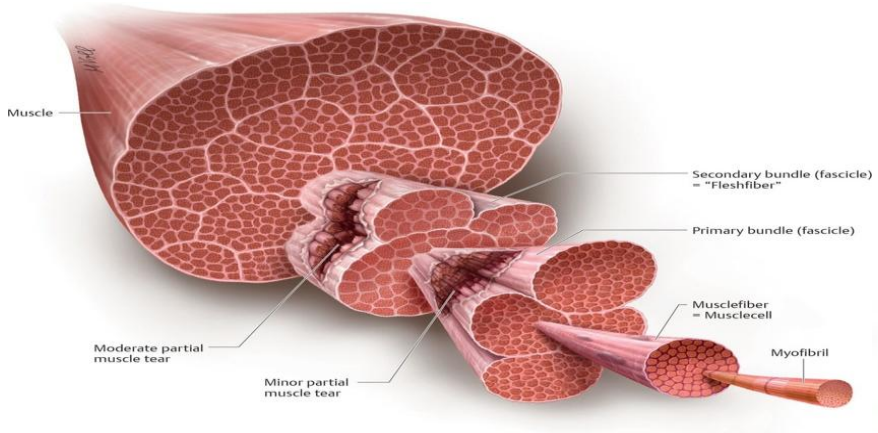
▫ **no injuries in this team**

Definitions and codes of location, diagnosis and severity see reverse

? **Injury Report Form**


WHAT HAPPENS
TO MUSCLES
DURING EXERCISE?


Hamstrings in Action
Extended Hip
Hamstrings
contracting and
working as
agonist
Flexed Knee
Quads
lengthening and
working as
antagonist


Muscle
Secondary bundle (fascicle)
= "Fleshfiber"
Primary bundle (fascicle)
Musclefiber
= Musclecell
Myofibril
Moderate partial
muscle tear
Minor partial
muscle tear

HMIs

Recurrence levels are high, 12% to 63%.

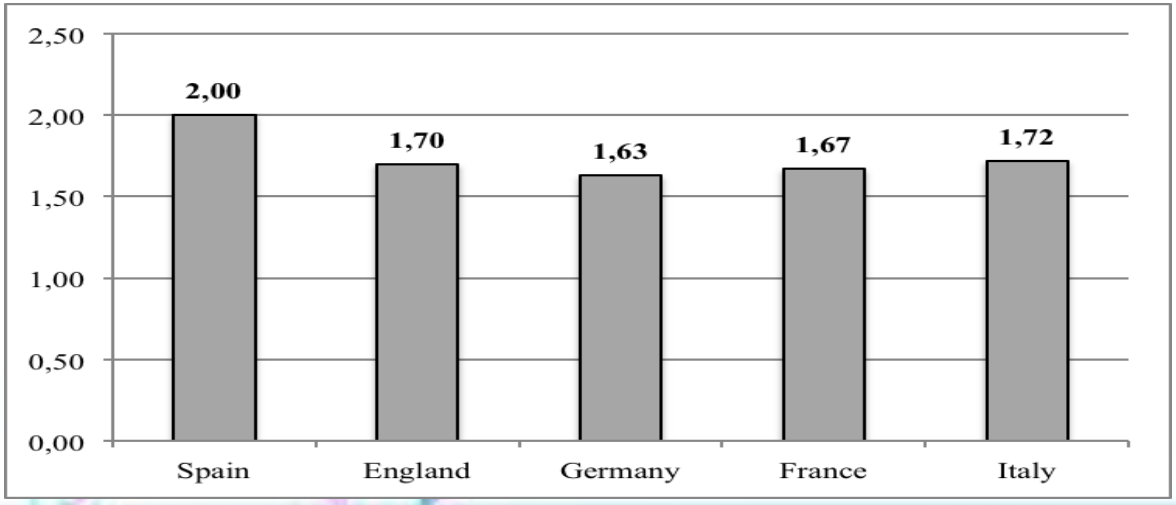
The first month after return to play (RTP) is the highest risk time for recurrence Though the risk remains elevated for at least **12 months**.

Orchard, 2012, Cross et al., 2015,Gabbett, 2016

Heiderscheit et al., 2010

	Distance (km)	Fast run distance (km)	Sprint distance (m)	Tackles made
Attackers	10.48	2.28	690	17
Midfield	11.00	2.23	440	18
Fullbacks	10.98	2.46	640	8
Central defender	9.74	1.69	440	18

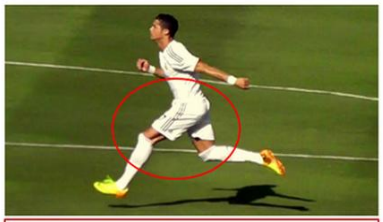
? Το ποδόσφαιρο είναι επικίνδυνο για HMIs



? HMIs είναι επικίνδυνα για το ποδόσφαιρο

Injury mechanism

Late phase of swing – Open Kinetic Chain



Started phase contact – Closed Kinetic Chain

PubMed

key: prevention, rehabilitation, injuries, sports, soccer, Hamstring

330 (1992-2015)

958 (2015 – 2016)

630

χρειάζεται περαιτέρω επιστημονική έρευνα στην εφαρμογή

προγραμμάτων πρόληψης

Σας ευχαριστώ πολύ για την προσοχή σας !