

Incidência de lesões em jogadores amadores de futebol: estudo prospetivo ao longo de uma época desportiva

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Resumo

Os estudos epidemiológicos sobre lesões em futebol são fundamentais para a prevenção das mesmas. No entanto, a informação resultante deste tipo de estudos está limitada aos jogadores profissionais de elite.

Objetivo: Determinar prospectivamente a epidemiologia de lesões em jogadores amadores de futebol, durante uma época desportiva completa.

Metodologia: 12 equipas masculinas de seniores amadores foram acompanhadas durante a época 2010–2011. A amostra inicial foi composta por 251 jogadores, com uma média de idades de 24.9 (intervalo 18–38) anos, dos quais 66.5% jogadores pertenciam ao nível competitivo regional e 35.5% competiram na 3ª Divisão nacional. A exposição a treinos e jogos, bem como todas as lesões, foram registadas prospectivamente de acordo com as recomendações do *FIFA – Medical Assessment and Research Centre* e *UEFA Medical Committee*.

Resultados: Registaram-se 237 lesões e 57% dos jogadores estiveram lesionados durante a época. A incidência média de lesões foi de 5.1 (95% IC: 4.3–5.8) por 1000 horas de prática e superior ($p < 0.001$) nos jogos [31.9 (95% IC: 23.7–40.2) lesões por 1000 horas], relativamente aos treinos [2.4 (95% IC: 1.8–2.9) lesões por 1000 horas]. A incidência de lesão foi superior ($p < 0.001$) nas equipas da 3ª divisão, comparativamente com as de nível regional (6.7, 95% IC: 5.3-8.1 vs. 4.2, 95% IC: 3.4-5.0). A maioria das lesões afetou os membros inferiores (85%). A coxa (21.1%) e o joelho (20.3%) foram as zonas mais afetadas, seguidas pelo tornozelo (18.1%). As lesões mais frequentes foram o estiramento/rotura muscular da coxa ($n=42$) e as lesões ligamentares do tornozelo e do joelho (39 e 27, respetivamente). O número médio de dias de ausência devido a lesão foi de 19.7 (95% CI: 16.5 to 22.9). Setenta e oito % das lesões foram de origem traumática e 22% de sobreuso. O principal mecanismo de lesão traumática foi o contacto com outro jogador (38%). As lesões por recidiva representaram 11% do total.

Conclusão: A incidência de lesões nos jogadores amadores de futebol foi elevada nos jogos e o nível competitivo poderá ser um fator de risco de lesão.

Palavras-Chave: futebol, nível competitivo, incidência, tipo de lesão, severidade.

Abstract

Background: Epidemiological studies in football are important to prevent injuries. However, most of the available information is limited to elite professional football players.

Objective: To prospectively determine the epidemiology of injuries in amateur football players, during one full competitive season.

Methods: 12 male senior amateur teams were followed during the 2010–2011 season. The initial sample consisted of 251 players, with an average age of 24.9 (range 18–38) years. A total of 167 (66.5%) players competed at regional level and 84 (35.5%) in the 3rd national division. Exposure (match and training) to football and all injuries were recorded prospectively, according to recommendations of the FIFA – Medical Assessment and Research Centre and UEFA Medical Committee.

Results: A total of 237 injuries were recorded and 57% of the players suffered injuries. The mean injury incidence was 5.1(95% CI: 4.3 to 5.8) injuries per 1000 hours. The injury incidence was statically higher ($p<0.001$) in matches [31.9 (95% CI: 23.7 to 40.2) injuries per 1000 hours] than in trainings [2.4 (95% CI: 1.8 to 2.9) injuries per 1000 hours]. The injury incidence was significantly higher ($p<0.001$) in 3rd division teams than in regional teams (6.7, 95% CI: 5.3–8.1 vs. 4.2, 95% CI: 3.4–5.0). Eighty-five % of the injuries affected the lower extremity. The thigh (21.1%) and the knee (20.3%) were the most affected regions, followed by the ankle (18.1%). The most frequent diagnoses were thigh strain/muscle rupture ($n=42$), and ankle and knee strain/ligament injury (39 and 27, respectively). The mean time of absence due to injury was 19.7 (95% CI: 16.5 to 22.9) days. Seventy-eight % of the injuries were traumatic and 22% were overuse injuries. The main contact mechanism was contact with other player (38%). Re-injuries accounted for 11% of all injuries sustained during the season.

Conclusion: The present study showed that the injury incidence was high in amateur football players during competition. The results also showed that competition level might be considered as a risk factor for injuries in amateur football.

Key-words: football, competitive level, incidence, injury type, severity.

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Revisão da Literatura

INTRODUÇÃO

O risco de lesão é um aspecto inerente à prática desportiva (Maffulli, Longo, Gougoulias, Caine, & Denaro, 2011). A incidência de lesões no desporto tem aumentado nos últimos anos em resposta ao aumento das exigências físicas e psíquicas que a atividade desportiva vem colocando, como é o caso do futebol.

A prática de futebol exige movimentos fisicamente muito exigentes, tais como saltos, sprints, acelerações, desacelerações, sendo muitas vezes acompanhados de contacto físico entre os intervenientes. De facto, o risco de lesão no futebol é um problema sério para os jogadores, para os clubes e para os sistemas públicos de saúde (Dupont et al., 2010; Faude, Junge, Kindermann, & Dvorak, 2006). A probabilidade de um futebolista profissional ter uma lesão pode ser 1000 vezes superior à de uma pessoa que exerce trabalhos industriais de alto risco (Hawkins & Fuller, 1999). Com efeito, tanto a *Fédération Internationale de Football Association* (FIFA), como a *Union des Associations Européennes de Football* (UEFA), têm demonstrado a sua preocupação acerca das exigências físicas e mentais a que os futebolistas estão sujeitos (Ekstrand, 2008; Ekstrand, Walden, & Hagglund, 2004a), bem como acerca da incidência, causas e severidade das lesões no futebol moderno (Brito, Soares, & Rebelo, 2009).

Com o intuito de atuar em termos de prevenção de lesões no futebol, é fundamental avaliar a epidemiologia das mesmas (Ekstrand, 2008). Daí que o objetivo final dos estudos sobre a incidência de lesões seja habitualmente a prevenção das mesmas (Hagglund, Walden, Til, & Pruna, 2010). Nestes estudos, procura-se conhecer as características e causas das lesões e monitorizar as alterações de longo prazo na sua ocorrência, no sentido de proteger a saúde dos atletas e fornecer informação sobre as lesões (Dvorak, Junge, Derman, & Schwellnus, 2011).

EPIDEMIOLOGIA DAS LESÕES NO FUTEBOL

Definição de lesão no futebol

Ao longo das últimas décadas, têm sido efetuados vários estudos sobre a incidência de lesões no futebol. No entanto, a utilização de diferentes definições e metodologias faz com que existam resultados e conclusões bastante divergentes, dificultando assim a comparação dos resultados dos vários estudos e identificação de métodos de diagnóstico e de prevenção de lesões (Arnason et al., 2004a; Brito et al., 2009; Ekstrand, Walden, & Hagglund, 2004b; Fuller et al., 2006; Hagglund et al., 2010; Junge, Dvorak, Baumann, & Peterson, 2004; Wong & Hong, 2005). De acordo com Ekstrand (2008), comparações significativas só podem ser efetuadas entre estudos que utilizam definições e metodologias semelhantes.

Neste sentido, a FIFA e a UEFA, através dos seus *staffs* médicos (Fuller et al., 2006; Hagglund, Walden, Bahr, & Ekstrand, 2005a), procuraram estabelecer um consenso acerca das definições de lesão, bem como a implementação de padrões de registo a adoptar nos estudos epidemiológicos das lesões em futebol. Assim, uma lesão no futebol define-se como qualquer tipo de ocorrência sofrida por um jogador, em competição ou em treino, que o obrigue a interromper a sua actividade e o impeça de participar em, pelo menos, um treino ou jogo. Adicionalmente, entende-se como lesão recorrente uma lesão do mesmo tipo e com a mesma localização de uma lesão prévia, que ocorre depois de o jogador ter regressado de forma plena aos treinos e/ou jogos após a lesão prévia (Fuller et al., 2006).

Classificação de lesão no futebol

A gravidade da lesão é definida pelo número de dias que o jogador fica afastado da atividade, isto é, desde o dia da lesão até à participação efetiva nos treinos e/ou jogos. Com efeito, as lesões podem ser: ligeiras (1–3 dias de ausência), *minor* (4–7 dias de ausência), moderadas (8–28 dias de ausência) e graves (mais de 28 dias de ausência) (Ekstrand, Timpka, & Hagglund, 2006; Hagglund et al., 2005a). A lesão deve ainda ser classificada quanto ao tipo, localização, lado corporal e ao mecanismo que a desencadeou. Quanto à causa, a lesão pode ser traumática, i.e. ocorre devido a uma situação específica e identificável (pancada, choque, queda, etc.), ou de sobreuso, i.e.

devido à repetição de micro-traumas, sem se identificar e/ou isolar a causa específica da lesão (Fuller et al., 2006).

Incidência de lesões: jogo vs. treino

O risco de lesão é elevado no futebol e 56–82% dos jogadores podem sofrer pelo menos uma lesão durante uma época desportiva (Arnason et al., 2004a; Azubuike & Okojie, 2009; Hagglund, Walden, & Ekstrand, 2005b), situando-se a incidência média de lesões em cerca de 6–9 lesões por 1000 horas de exposição (Ekstrand, 2008; Hawkins & Fuller, 1999).

Existe um consenso geral entre os investigadores quanto à ideia de que a incidência de lesões é maior em situação de competição do que em situação de treino (Murphy, Connolly, & Beynnon, 2003). Na verdade, os estudos têm demonstrado uma incidência de lesão de 24–48.7 lesões por 1000 horas de jogo e de 2.1–11.8 lesões por 1000 horas de treino em futebolistas profissionais (Arnason et al., 2004a; Dupont et al., 2010; Ekstrand, 2008; Hagglund et al., 2005b; Hagglund, Walden, & Ekstrand, 2006; Hawkins & Fuller, 1999; Walden, Hagglund, & Ekstrand, 2005), de 18.7–25.4 (jogo) e 3.3–4.3 (treino) lesões por 1000 horas de exposição em jogadores universitários praticantes de futebol em piso sintético (Agel, Evans, Dick, Putukian, & Marshall, 2007; Fuller, Dick, Corlette, & Schmalz, 2007a, 2007b), e de 19.5–20.7 (jogo) e 5.7 (treino) lesões por 1000 horas de prática em futebolistas amadores (Kordi, Hemmati, Heidarian, & Ziaee, 2011; Poulsen, Freund, Madsen, & Sandvej, 1991).

No âmbito dos jogos entre seleções e durante torneios internacionais de seniores masculinos, a incidência de lesões no jogo tem sido muito elevada, nomeadamente 41.6–113.4 por 1000 horas de jogo (Dvorak et al., 2011; Dvorak, Junge, Grimm, & Kirkendall, 2007; Hagglund, Walden, & Ekstrand, 2009a; Hawkins & Fuller, 1996; Junge et al., 2004), enquanto que no treino esse valor desce para 2.8–7.9 lesões por 1000 horas de prática (Dvorak et al., 2011; Ekstrand et al., 2004b; Hagglund et al., 2009a). O facto da incidência de lesões ser superior nestas competições poderá ser explicado pela sobrecarga de jogos com que os jogadores chegam a este tipo de competições (Dvorak et al., 2011). Na realidade, o calendário congestionado pode contribuir para um maior risco de lesão. Um elevado número de jogos no final da época pode

trazer consigo o aumento dos níveis de fadiga e o conseqüente aumento do risco de lesão e/ou sub-rendimento nos períodos seguintes, nomeadamente nos torneios a nível internacional (Ekstrand et al., 2004a). Com efeito, verificou-se que a incidência de lesões era significativamente mais elevada em atletas que disputavam dois jogos por semana em comparação com os que efetuavam apenas um jogo (Dupont et al., 2010). Porém, foi também aventada a possibilidade de este aumento da incidência de lesões poder ser explicado pela elevada pressão colocada sobre os jogadores durante os grandes torneios internacionais (Dvorak et al., 2007).

Em síntese, a incidência de lesões nos jogos é cerca de 4 a 6 vezes maior no jogo do que do que no treino (Junge & Dvorak, 2004). Tal poderá ser conseqüência das maiores exigências físicas, fisiológicas e mentais que o jogo acarreta (Hagglund et al., 2005b).

Incidência de lesões: momento do jogo

Diversos estudos referem, quer em jogadores amadores (Kordi et al., 2011; Tsiganos, Sotiropoulos, & Baltopoulos, 2007), quer em jogadores profissionais (Arnason et al., 2004a; Hawkins & Fuller, 1998; Rahnama, Reilly, & Lees, 2002), a tendência para um maior número de lesões na segunda parte do jogo do que na primeira, não se encontrando, no entanto, diferenças significativas entre as duas partes do jogo. Porém, outros estudos verificaram uma maior incidência de lesões na segunda parte do jogo comparativamente com a primeira, bem como uma incidência superior nos últimos quinze minutos de cada parte do que nos restante períodos (Hawkins & Fuller, 1999; Hawkins, Hulse, Wilkinson, Hodson, & Gibson, 2001).

Nas competições entre seleções, verificou-se o mesmo padrão lesional, ou seja, mais lesões na segunda parte, nuns casos sem significado estatístico (Dvorak et al., 2011; Junge et al., 2004) e, noutros casos, com significado estatístico (Hawkins & Fuller, 1996). Em doze campeonatos europeus de futebol entre seleções, disputados entre 2006 e 2008 (Hagglund et al., 2009a), verificou-se que as lesões traumáticas ocorreram significativamente em maior número na segunda, comparativamente com a primeira parte dos jogos. No entanto, nas lesões de não contacto, não foram encontradas diferenças estatísticas entre as duas partes do jogo. De salientar que apenas num

campeonato do mundo (2006) se verificou uma idêntica incidência de lesões nas duas partes do jogo (Dvorak et al., 2007).

As lesões musculares apresentam uma incidência significativamente mais alta no final de cada parte, o que sugere que a fadiga será um factor predisponente para este tipo de lesão (Ekstrand, Hagglund, & Walden, 2011; Petersen, Thorborg, Nielsen, & Holmich, 2010; Woods et al., 2004).

O facto do risco de lesão ser maior na segunda parte do jogo, sobretudo nos últimos quinze minutos, aponta também para a importância da fadiga como fator predisponente de lesão no futebol (Hawkins et al., 2001; Rahnema et al., 2002). De acordo com Hagglund et al. (2009a), o aumento da incidência de lesões de contacto na segunda parte deverá estar associado à fadiga e à falta de concentração dos jogadores, não devendo também ser excluída a possibilidade de existir um aumento da intensidade e da frequência de contactos no final dos jogos, altura em que os jogadores se esforçam mais por alcançar os objetivos definidos para o jogo.

Deve, no entanto, ser realçado o facto dos estudos realizados no âmbito das lesões no futebol não terem encontrado qualquer associação entre os incidentes, a severidade das lesões e os períodos do jogo (Arnason, Tenga, Engebretsen, & Bahr, 2004b; Cloke, Spencer, Hodson, & Deehan, 2009; Junge et al., 2004).

Incidência de lesões por posições no terreno de jogo

As ações e movimentos requeridos pelos diferentes estatutos posicionais podem sugerir que os jogadores de certas posições poderão estar mais sujeitos a determinados mecanismos de lesão (Azubuike & Okojie, 2009). Contudo, não existem na literatura muitos estudos que tenham investigado a relação entre a posição no terreno de jogo e o risco de lesão. Além disso, os estudos que se debruçaram sobre este tópico não encontraram resultados muito consistentes.

Segundo alguns estudos, os defesas sofrem mais lesões do que os jogadores das restantes posições (Azubuike & Okojie, 2009; Hawkins & Fuller, 1996). A análise das lesões na cabeça e no pescoço com base em jogos de 20 torneios da FIFA, entre 1998 e 2004, mostrou resultados idênticos, sendo a

distribuição de lesões a seguinte: defesas, 40%; avançados, 23%; médios, 22%; e guarda-redes, 15% (Fuller, Junge, & Dvorak, 2005).

No entanto, outros estudos envolvendo jogadores profissionais de diversos níveis competitivos não encontraram diferenças significativas na prevalência de lesões entre as diferentes posições (Hassabi et al., 2010; Hawkins & Fuller, 1998; Morgan & Oberlander, 2001; Woods, Hawkins, Hulse, & Hodson, 2002; Woods et al., 2004), tendo-se verificado os seguintes resultados: defesas, 19–50%; médios, 22–57%; avançados, 4–24%; e guarda-redes, 4–16%.

Dois estudos que analisaram as lesões dos músculos isquiotibiais de jogadores profissionais reportaram resultados idênticos: defesas, 37–40%; médios, 30–42%; e avançados, 13–25% (Petersen et al., 2010; Woods et al., 2004). De realçar que o risco deste tipo de lesão foi extremamente baixo entre os guarda-redes (0–3%).

Com base no que foi exposto, podemos aceitar que, de um modo geral, no futebol masculino os médios e os defesas parecem sofrer mais lesões comparativamente com os avançados, sendo, a posição de guarda-redes a menos afetada pelas lesões. Por outro lado, parecem existir algumas diferenças no futebol feminino relativamente aos homens, pois são os defesas e avançados quem apresenta uma maior incidência de lesões (Faude et al., 2006; Jacobson & Tegner, 2007).

Relativamente à zona do terreno de jogo onde ocorrem as lesões, e, de acordo com Rahnama et al. (2002), 40% das lesões acontecem no terço intermédio, 30% no terço defensivo e 30% no terço ofensivo. No entanto, o risco de lesão parece ser maior nas zonas onde a posse de bola é disputada com mais vigor, isto é, nas zonas próximas das balizas (Rahnama et al., 2002).

Incidência de lesões e dominância lateral

Em certos desportos, como o futebol, o membro inferior dominante poderá ter maior suscetibilidade de risco de lesão, uma vez que é preferencialmente utilizado nas diversas ações de jogo. No entanto, a associação entre a dominância lateral e o risco de lesão é controversa (Murphy et al., 2003).

Alguns estudos realizados com atletas masculinos profissionais (Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001) e com mulheres (Faude et al., 2006) têm encontrado uma incidência significativamente superior de lesões no membro dominante, em relação ao membro não dominante. O mesmo foi observado em jovens futebolistas, verificando-se que as lesões mais graves afetam mais o membro dominante (Cloke et al., 2009).

Independentemente do escalão etário, verificou-se que, em futebolistas masculinos, mais de metade das lesões no ligamento cruzado anterior do joelho aconteciam no membro dominante, maioritariamente em situações de não contacto (Brophy, Silvers, Gonzales, & Mandelbaum, 2010).

Ekstrand et al. (2011) observaram que as lesões musculares no músculo quadríceps acontecem sobretudo no membro inferior dominante (60%). No entanto, as lesões nos restantes grupos musculares da coxa parecem acontecer em menor número no membro dominante.

Outros estudos que analisaram lesões mais específicas não encontraram diferenças na incidência de lesão nos músculos da coxa (Witvrouw, Danneels, Asselman, D'Have, & Cambier, 2003), dos isquiotibiais (Woods et al., 2004), do ligamento cruzado anterior (Walden, Hagglund, & Ekstrand, 2006) e das lesões na virilha (Werner, Hagglund, Walden, & Ekstrand, 2009) em função da dominância lateral.

Lesões e tipo de piso

Nos últimos anos, tem-se verificado um aumento do número de campos de futebol com relva artificial. A FIFA e a UEFA têm incentivado a substituição dos relvados naturais por relvados artificiais, pois para desenvolvimento da modalidade será mais benéfico ter um tipo de piso que possa ser utilizado durante todo o ano, independentemente das condições climatéricas. Acrescem ainda os benefícios financeiros (baixos custos de manutenção e a possibilidade de serem usados para diferentes fins) e o facto do mesmo campo poder servir para treinos e jogos, bem como ser utilizado pelos diferentes escalões competitivos do mesmo clube (FIFA, 2011).

No entanto, apesar das vantagens da utilização de relvados artificiais, os futebolistas parecem ter algumas reservas quanto à prática de futebol neste tipo de piso. Andersson, Ekblom e Krustup (2008) verificaram que futebolistas

profissionais suecos têm uma atitude negativa face à relva artificial, sentindo dificuldades no controlo de bola e uma maior exigência física durante o jogo. Além disso, os relvados artificiais têm sido associados a uma maior incidência de lesões (Ekstrand et al., 2006), existindo mesmo a percepção de que o risco de lesão é maior nos relvados artificiais do que na relva natural (Fuller et al., 2007a). De facto, um estudo realizado nos anos 90 demonstrou uma maior incidência de lesões em relva artificial do que em relva natural, mas há que realçar que este estudo analisou relvados artificiais muito diferentes dos que existem hoje em dia (Arnason, Gudmundsson, Dahl, & Johannsson, 1996).

Na verdade, estudos mais recentes têm demonstrado resultados que contrariam os factos anteriores. Ekstrand et al. (2006) verificaram que a incidência de lesão de futebolistas europeus de elite era idêntica em jogos disputados em relvado artificial ou em relva natural. Porém, foi encontrada uma maior incidência de lesões ligamentares no tornozelo (entorse) e uma menor incidência de lesões musculares dos membros inferiores nos jogos realizados em relva artificial. Outros estudos não encontram diferenças entre relva artificial e relva natural na incidência, natureza e causa das lesões, quer no jogo, quer no treino de futebolistas de ambos os sexos (Fuller et al., 2007a, 2007b). No entanto, num estudo recente sobre lesões musculares (Ekstrand et al., 2011), foi reportado que a incidência de lesão no jogo foi menor nas equipas que jogavam em relvado artificial do que nas que jogavam em relva natural.

Em suma, pelo que foi atrás exposto, e confirmando a opinião de Fuller et al. (2007a), o risco de lesão em relvado artificial parece não diferir significativamente daquele atribuído à relva natural.

Localização das lesões

Um dado consensual entre os estudos que têm descrito a localização das lesões no futebol é o facto da maioria das lesões (74–95%) ocorrer nos membros inferiores (Andersen et al., 2004; Arnason et al., 2004b; Dvorak et al., 2011; Hagglund et al., 2005b; Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001; Poulsen et al., 1991; Tsiganos et al., 2007).

As zonas mais afetadas são a coxa (14–23%), tornozelo (11–26%), joelho (14–22%), perna (11–21%), anca/virilha (11–16%) e pé (7–21%) (Azubuike & Okojie, 2009; Dvorak et al., 2007; Hagglund et al., 2005b; Hawkins

& Fuller, 1999; Hawkins et al., 2001; Junge et al., 2004; Kordi et al., 2011; Poulsen et al., 1991; Walden et al., 2005; Werner et al., 2009). Porém, apesar de afetarem mais os membros inferiores, também ocorrem lesões no tronco, cara e cabeça (Reilly & Howe, 2003).

Atualmente, a coxa parece ser a zona mais afetada no futebol masculino (Dvorak et al., 2011; Hagglund et al., 2005b, 2006; Walden et al., 2005). Na verdade, os futebolistas de elite têm um elevado risco de lesão, sobretudo na zona da coxa (Walden et al., 2005), enquanto que, nas mulheres e jovens, esse risco é maior na articulação do joelho (Wong & Hong, 2005). A articulação do tornozelo é também uma das zonas mais lesadas, o que pode ser explicado pelo facto da bola estar perto dos pés e tornozelos e, como se sabe, a bola é o centro de toda a atividade no jogo (Faude et al., 2006; Wong & Hong, 2005). No entanto, num estudo longitudinal realizado com futebolistas de elite durante cinco anos, notou-se uma redução de quase 50% das entorses no tornozelo, o que traduz um maior conhecimento na prevenção e reabilitação desse tipo de lesão (Ekstrand, 2008).

A articulação do joelho também requer muita atenção, uma vez que a maioria das lesões graves no futebol está relacionada com esta articulação (Arnason et al., 2004a; Hagglund, Walden, & Ekstrand, 2009b; Walden et al., 2005, 2006). De facto, o joelho é altamente solicitado e exposto a traumas, sendo frequentemente lesado. Neste sentido, a rotura do ligamento cruzado anterior (LCA) é uma das lesões mais comuns (Stewien & Camargo, 2005), conjuntamente com os estiramentos e roturas do ligamento colateral medial (Arnason et al., 2004a; Walden et al., 2005). Acrescente-se que os jogadores com histórico de lesão no LCA poderão ter maior propensão de sofrer de sinovite e osteoartrite do joelho (Walden et al., 2006). No entanto, as investigações têm demonstrado que o treino proprioceptivo e neuromuscular parecem reduzir as lesões severas do joelho (Junge & Dvorak, 2004).

A zona púbica é também uma das zonas de maior localização de lesões nos membros inferiores (Arnason et al., 2004a; Hagglund et al., 2005b, 2006; Hassabi et al., 2010; Hawkins & Fuller, 1999), sendo as lesões mais comuns as lesões dos adutores, seguindo-se as lesões nos flexores da anca/iliopsoas e dores sem localização específica (Arnason et al., 2004a; Hagglund et al., 2009b; Werner et al., 2009). A maioria das lesões na zona púbica são de

sobreuso (Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2010a; Hagglund et al., 2005b; Werner et al., 2009), e os principais fatores de risco têm sido associados à elevada sobrecarga de jogos e treinos durante o período competitivo, inadequada recuperação após uma lesão prévia e idade dos jogadores (Chomiak, Junge, Peterson, & Dvorak, 2000). No entanto, apesar das lesões na zona púbica serem comuns no futebol, o seu diagnóstico e tratamento são complicados (Werner et al., 2009).

Tipos de lesão

Nos estudos epidemiológicos, tem sido demonstrado que a maioria das lesões é de natureza traumática (59–87%), sendo as lesões de sobreuso menos comuns (13–41%) (Azubuike & Okojie, 2009; Ekstrand et al., 2006; Hagglund et al., 2009b; Poulsen et al., 1991; Walden et al., 2005). As primeiras tendem a ocorrer mais nos jogos, enquanto as segundas nas sessões de treino (Agel et al., 2007; Hagglund et al., 2005b; Walden et al., 2005) e na pré-época (Woods et al., 2002). As lesões traumáticas parecem causar mais dias de ausência (Walden et al., 2005).

Num estudo recente com atletas de elite do futebol europeu (Dupont et al., 2010), verificou-se que a maioria das lesões foi de sobreuso (76%), o que, segundo os mesmos autores, poderá ser reflexo duma recuperação inadequada entre jogos, levando à fadiga e ao aumento do risco de lesão.

As lesões traumáticas mais comuns são: estiramentos e/ou roturas musculares ou tendinosas, entorses e/ou roturas dos ligamentos e das cápsulas articulares, da cartilagem e menisco, e contusões (Ekstrand et al., 2006; Junge & Dvorak, 2004). Nas competições internacionais de seleções tem-se observado que as entorses ocorrem preferencialmente no tornozelo e joelho, os estiramentos e roturas afetam predominantemente a coxa e virilha, e as contusões ocorrem mais sobre a coxa e perna (Dvorak et al., 2007, 2011). De igual modo, observações semelhantes têm sido verificadas com jogadores profissionais no decorrer das competições de clubes (Arnason et al., 2004a; Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005), em jogadores universitários (Agel et al., 2007) e mesmo com futebolistas amadores (Kordi et al., 2011; Tsiganos et al., 2007).

As lesões musculares são um problema substancial para os jogadores, podendo uma equipa de vinte e cinco atletas ter quinze lesões musculares por época, que requerem em média duas semanas de paragem. Os grupos musculares mais afetados são os isquiotibiais (37%), seguidos dos adutores da coxa (23%) e os quadricíptes (19%) (Ekstrand et al., 2011).

Outro problema no futebol, em todos os níveis competitivos, é a reincidência de lesões. Os estudos têm demonstrado que as lesões recorrentes representam entre 7–39% do total das lesões e acontecem preferencialmente nas situações de treino, sendo, em grande parte, de sobreuso (Azubuike & Okojie, 2009; Hagglund et al., 2005b; Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005). Relativamente às lesões musculares, as recidivas representam 16% do número total de lesões (Ekstrand et al., 2011) e 12% das lesões nos músculos isquiotibiais (Woods et al., 2004).

De acordo com Hawkins e Fuller (1999), o facto de acontecerem mais lesões recorrentes nos treinos sugere que muitas lesões ocorrem ainda durante o processo de reabilitação, não estando os jogadores totalmente recuperados. Deste modo, é essencial uma correta e adequada recuperação, uma vez que as recidivas tendem a causar mais dias de ausência do que as lesões não recorrentes (Hagglund et al., 2009b).

Severidade das lesões

Apesar das divergências na definição de lesão, bem como nas metodologias anteriormente usadas, os estudos têm demonstrado maior incidência de lesões ligeiras (1–3 dias), *minor* (4–7 dias) e moderadas (7–28 dias), sendo que cada lesão acarreta, em média, 10–24 dias de ausência da prática desportiva (Arnason et al., 2004a; Azubuike & Okojie, 2009; Ekstrand et al., 2006; Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001; Poulsen et al., 1991; Walden et al., 2005).

Facto comum em quase todos os estudos é que as lesões graves ou severas estão, na maioria, relacionadas com lesões na articulação do joelho (Agel et al., 2007; Arnason et al., 2004a; Hagglund et al., 2005b; Junge et al., 2004; Walden et al., 2005, 2006). De acrescentar que as lesões severas acontecem preferencialmente no período competitivo (Woods et al., 2002).

Mecanismos de lesão

Como foi exposto anteriormente, a maioria das lesões é de origem traumática, acontecendo principalmente nos jogos. O principal mecanismo de lesão, apontado em quase todos os estudos, é o contacto com o adversário, sendo responsável por 40–72% das lesões (Junge & Dvorak, 2004). Das situações de contacto, 12–23% das lesões são resultado de entradas faltosas por parte de um jogador adversário (Hagglund et al., 2005b; Hawkins & Fuller, 1999; Walden et al., 2005).

Em vários torneios europeus e mundiais de seleções, estes valores são mais elevados (40–91%), sendo 15–57% das lesões resultado de entradas faltosas (Dvorak et al., 2007, 2011; Hagglund et al., 2009a; Hawkins & Fuller, 1996; Junge et al., 2004).

De um modo geral, os principais mecanismos de contacto são, sobretudo, sofrer um *tackle*, mas também sofrer uma carga e realizar um *tackle* (Rahnama et al., 2002). De igual modo, os estudos têm demonstrado que os mecanismos mais comuns para as lesões nos membros inferiores são *tackling*, corrida, sofrer um *tackle*, rematar, torções, rotações, saltos e receções no solo (Wong & Hong, 2005). Acrescente-se ainda que os contactos são um fator chave nas contusões, entorses, problemas de joelho e nas concussões (Agel et al., 2007).

Outros mecanismos de contacto são, por ordem de incidência, o contacto com a bola, com a superfície de jogo e com outros objetos (Agel et al., 2007; Fuller et al., 2007a, 2007b).

As lesões de não contacto representam 14–36% do total de lesões (Dvorak et al., 2007, 2011; Hagglund et al., 2009b; Hawkins & Fuller, 1996; Junge et al., 2004). De acordo com alguns estudos, os mecanismos de lesão por não contacto incluem rotações, corrida, saltos e remates (Hawkins & Fuller, 1999; Hawkins et al., 2001; Woods et al., 2002).

No que respeita às lesões musculares, a maioria resulta de situações de não contacto (corrida, sprint) e apenas uma percentagem muito reduzida deriva do contacto com o adversário (Ekstrand et al., 2011; Woods et al., 2004).

Fatores de risco de lesão

As lesões são resultado de múltiplas causas, devido a fatores intrínsecos (relativos ao jogador) e extrínsecos (referentes ao envolvimento) (Arnason et al., 2004a; Hawkins & Fuller, 1996). Embora possa parecer que uma lesão resulte de um única causa, é mais provável que uma lesão desportiva seja resultado de uma interação complexa dos dois tipos de fatores (Meeuwisse, 1994).

Os principais fatores de risco extrínsecos são o comportamento dos jogadores, as condições climatéricas, o estado do campo, o calçado, o aquecimento inadequado e a superfície de jogo (Reilly & Howe, 2003). Dvorak et al. (2000) referem que o comportamento dos jogadores assume-se como fator extrínseco de extrema importância, uma vez que a maioria das lesões ocorre devido entradas faltosas dos jogadores. No que diz respeito à superfície de jogo, é de notar que se verificaram significativamente mais lesões nos campos de terra do que em relva artificial e relva natural (Kordi et al., 2011; Tsiganos et al., 2007), e que as superfícies secas e duras poderão constituir um fator de risco de lesão, sobretudo para futebolistas profissionais (Woods et al., 2002).

Outro importante fator de risco extrínseco é o nível competitivo, uma vez que vários estudos indicam um aumento da incidência de lesões com o aumento do nível competitivo (Agel et al., 2007; Azubuike & Okojie, 2009; Dvorak et al., 2007; Ekstrand et al., 2004b; Reilly & Howe, 2003; Woods et al., 2004).

Registe-se, ainda, que o risco de lesão poderá variar entre países e regiões e alguns estudos têm obtido resultados que o comprovam (Arnason, Andersen, Holme, Engebretsen, & Bahr, 2008; Hagglund et al., 2005b; Jacobson & Tegner, 2006; Walden et al., 2005). Tal poderá resultar de diversos aspetos, a saber: diferentes estilos de jogo e hábitos de treino (Arnason et al., 2004a; Fuller et al., 2007b), diferenças táticas, decisões de arbitragem, condições climatéricas, diferenças culturais e diferenças no piso de jogo (Jacobson & Tegner, 2006; Walden et al., 2005).

No que concerne aos fatores de risco intrínsecos, encontramos o estado mental do jogador (Reilly & Howe, 2003), podendo alguns traços psicológicos serem fatores propícios ao aumento do risco de lesão (Ivarsson & Johnson,

2010). As dimensões corporais podem também ser consideradas como um fator de risco, pois Faude et al. (2006) verificaram que as jogadoras de futebol de estatura mais elevada apresentaram maior propensão de lesão. No entanto, outros autores não encontraram relação entre as dimensões corporais e o risco de lesão (Arnason et al., 2004a). Outro fator de risco referenciado é o sexo dos jogadores e, pelo que se tem verificado, na totalidade das lesões, parece haver uma menor incidência de lesões nas mulheres do que nos homens (Fuller et al., 2007a; Junge et al., 2004; Wong & Hong, 2005), sendo possivelmente reflexo da maior força dos homens e dos diferentes estilos de jogo entre sexos. A idade parece ser também um fator a considerar, sendo a incidência de lesões maior com o aumento da idade (Arnason et al., 2004a; Dvorak et al., 2007; Hagglund et al., 2009a; Reilly & Howe, 2003). Os estudos indicam mais lesões nos adultos do que nos jovens jogadores (Roaas & Nilson, 1979; Schmikli, de Vries, Inklaar, & Backx, 2010) e, mesmo em jovens futebolistas, verifica-se um incremento das lesões com o aumento da idade (Cloke et al., 2009).

De todos os fatores de risco intrínsecos, a lesão prévia parece ser o fator mais consistentemente identificado na literatura (Engebretsen et al., 2010a). Vários estudos têm confirmado que os jogadores que contraíram uma lesão têm significativamente mais possibilidades de voltarem a lesionar-se (Arnason et al., 2004a; Engebretsen et al., 2010a; Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2010b). Hagglund et al. (2006) verificaram que os jogadores que sofreram uma lesão numa época têm uma probabilidade três vezes superior de voltarem a lesionar-se na época seguinte. Também Walden et al. (2006) verificaram que o risco de ter uma lesão no joelho, especialmente por sobreuso, é significativamente maior nos jogadores com história de uma lesão no ligamento cruzado anterior do que aqueles que não tiveram lesão prévia. Deste modo, uma inadequada recuperação pode ser um fator de risco para o reaparecimento de lesões (Schmikli et al., 2010), pelo que é fundamental o adequado e correto tratamento das lesões para a prevenção da reincidência (Arnason et al., 2004a; Hagglund et al., 2006).

Artigo original

Injuries among amateur football players: a prospective study during one full season.

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ABSTRACT

Background: Epidemiological studies in football are important to prevent injuries. However, most of the available information is limited to elite professional football players.

Objective: To prospectively determine the epidemiology of injuries in amateur football players, during one full competitive season.

Methods: 12 male senior amateur teams were followed during the 2010–2011 season. The initial sample consisted of 251 players, with an average age of 24.9 (range 18–38) years. A total of 167 (66.5%) players competed at regional level and 84 (35.5%) in the 3rd national division. Exposure (match and training) to football and all injuries were recorded prospectively, according to recommendations of the FIFA – Medical Assessment and Research Centre and UEFA Medical Committee.

Results: A total of 237 injuries were recorded and 57% of the players suffered injuries. The mean injury incidence was 5.1(95% CI: 4.3 to 5.8) injuries per 1000 hours. The injury incidence was statically higher ($p<0.001$) in matches [31.9 (95% CI: 23.7 to 40.2) injuries per 1000 hours] than in trainings [2.4 (95% CI: 1.8 to 2.9) injuries per 1000 hours]. The injury incidence was significantly higher ($p<0.001$) in 3rd division teams than in regional teams [6.7 (95% CI: 5.3–8.1 vs. 4.2, 95% CI: 3.4–5.0)]. Eighty-five % of the injuries affected the lower extremity. The thigh (21.1%) and the knee (20.3%) were the most affected regions, followed by the ankle (18.1%). The most frequent diagnoses were thigh strain/muscle rupture ($n=42$), and ankle and knee strain/ligament injury (39 and 27, respectively). The mean time of absence due to injury was 19.7 (95% CI: 16.5 to 22.9) days. Seventy-eight % of the injuries were traumatic and 22% were overuse injuries. The main contact mechanism was contact with other player (38%). Re-injuries accounted for 11% of all injuries sustained during the season.

Conclusion: The present study showed that the injury incidence was high in amateur football players during competition. The results also showed that competition level might be considered as a risk factor for injuries in amateur football.

Key-words: football, competitive level, incidence, injury type, severity.

INTRODUCTION

The risk of injury is an inherent aspect of sports (Maffulli, Longo, Gougoulas, Caine, & Denaro, 2011). The incidence of injuries has increased in recent years due to major physical and psychological demands of sports, e.g. football. Football practice requires very physically demanding movements, such as jumps, sprints, accelerations, decelerations, and these are often accompanied by physical contact between players. In fact, the risk of injury in football is a serious problem for the players—in terms of health and performance—for the clubs, and for the public health systems (Dupont et al., 2010; Faude, Junge, Kindermann, & Dvorak, 2006). The probability of a professional player having an injury was estimated to be 1000 times higher than a person that holds high-risk industrial jobs (Hawkins & Fuller, 1999). Therefore, the *Fédération Internationale de Football Association* (FIFA) and the *Union des Associations Européennes de Football* (UEFA) expressed their concerns regarding the physical and mental demands of modern football, as well as the incidence, causes and severity of injuries (Ekstrand, 2008; Ekstrand, Walden, & Hagglund, 2004a).

In recent years, the number of football fields with artificial turf increased dramatically. FIFA has been encouraging the replacement of natural grass by artificial turf, arguing that the development of the sport will be higher with more fields that can be used throughout the year independently of the weather conditions (FIFA, 2011). In this sense, beyond the climatic advantages, there are financial benefits (lower maintenance costs and the possibility to be used for different events). The same surface can be used for training and competitions, as can be used by all the teams (youth and senior; male and female) from the same club (FIFA, 2011).

However, despite the advantages of artificial turf, players seem to have some concerns about practicing football in this type of surface. As an example, Andersson, Ekblom, & Krustrup (2008) reported that Swedish professional players had a negative attitude towards to artificial turf, by feeling more difficulties on ball control and by perceiving a higher physical effort when playing in artificial turf comparing with natural grass. Additionally, there is the general perception that the risk of injury is higher in artificial turf than in natural grass (Fuller, Dick, Corlette, & Schmalz, 2007a). In fact, players, coaches and

club officials still complain that many injuries result from playing on artificial turf. However, few studies so far tried to address the risk of playing football in artificial turf (Andersson et al., 2008; Pérez Soriano, Llana Belloch, Cortell Tormo, & Pérez Turpin, 2009).

Despite the growing interest in studying the injury patterns in football (Poulsen, Freund, Madsen, & Sandvej, 1991), the relationship between artificial surfaces and the risk of injury is poorly documented, and the few existing studies presented methodological limitations (Ekstrand, Timpka, & Hagglund, 2006). The available information is limited to elite professional soccer players (Fuller, Dick, Corlette, & Schmalz, 2007b), but elite players are only a small portion of all football players worldwide (Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2010). Moreover, due to the maintenance-related economical costs previously mentioned, artificial turf is more disseminated among amateur clubs than in top-level football clubs.

Therefore, the aim of the present study was to prospectively determine the epidemiology of injuries on artificial turf in amateur football players, during one competitive season.

METHODS

Participants

The present study was conducted in the archipelago of Azores, Portugal. Before the start of the 2010-2011, 12 male senior amateur teams were invited to participate in the study. All the teams accepted to participate in the survey. The 12 teams were competing in two different competitive levels: 3rd Portuguese national division (4 teams), and Azorean regional championship (8 teams). The study was approved by the Scientific Committee of the Faculty of Sport of the University of Porto, and by the club officials. Players provided informed consent.

The teams were followed during the 2010–11 football season. The 3rd division teams had the first official match on September 5. Six teams from the regional championship started competing on September 19, while the other two teams performed their first official match on October 3. The 3rd division teams started preseason in the first week of August. The majority of regional teams started preseason in the last week of August, except two teams; one started in

the second week and another one in the third week of the same month. Regarding the ending of season, two teams did the last match in April, four in the beginning of May, five at the end of May, and one team finished the season on June 13.

All teams played and trained on artificial turf, with the exception of one 3rd national division team, which played home games on natural grass, but trained on both natural grass and artificial turf.

The initial sample consisted of 251 players, with an average age of 24.9 ± 4.6 years (range 18–38). A total of 167 (66.5%) players competed in the regional championship teams and 84 (35.5%) participated in the 3rd national division. 211 players had the right leg as preferred kicking leg and 40 players had the left leg as dominant. Leg dominance was assessed as the leg preferred to kick a ball. The coaching staff of each club provided information about age and leg dominance of the players. Table 1 shows data concerning the distribution of players by field position.

Table 1: Distribution of players by field position and average age.

Position	n	%	Age (Mean ± SD)
Goalkeeper	30	12.0	25.0 ± 5.1
Defender	81	32.2	25.1 ± 4.7
Midfielder	72	28.7	25.2 ± 4.4
Forward	68	27.1	24.6 ± 4.7
Total	251	100.0	24.9 ± 4.6

Definitions of injury and data collection procedures

The definitions of injury and re-injury, and the procedures for data collection of injuries, followed the recommendations of the FIFA – Medical Assessment and Research Centre (Fuller et al., 2006) and the UEFA Medical Committee (Hagglund, Walden, Bahr, & Ekstrand, 2005a). A specific report form was created to collect and record the data from each injury.

In order to ensure a greater reliability in data collection, an instruction manual was created with the different definitions and procedures to be followed in data collection. The manual was delivered to the person responsible for the registration of injuries of each club. In 6 teams the data from injuries were prospectively recorded by the teams' physiotherapists; in 3 clubs this procedure

was done by the teams' physicians; and in the 3 clubs by one member of the research team who visited the clubs on a weekly basis. Throughout the season, one member of the research team had regular contact (weekly or biweekly) with the clubs, either by phone or personally. According to Hagglund et al. (2005a), exposure should be recorded individually, based on real exposure time and not on estimates. Therefore, match play and training exposure was recorded individually for each player by the coaching staff of each team. In the beginning of the study, a database was created, where all information about the players (field position, limb dominance, competitive level, and age) was recorded. Also, information about match play and training exposure were recorded monthly, as well data from injuries. The same member of the research team made all the records.

Players who were injured at the start of the study were included on the survey, but those injuries were not recorded. Only injuries that occurred in games or practices were recorded. All injuries that occurred under others circumstances were not included in the study.

Information about the players who entered and left the clubs during the season was recorded, and those players were also included in the study. During the study, five players were later assigned to regional level teams, and five players were assigned to 3rd division teams. Throughout the study, thirteen players left the clubs: 11 from regional level teams and two from 3rd division teams.

After performing the last game of the season, the injured players were followed, and the contact with these players or with the teams' physiotherapist was maintained, following the indications of medical staffs from UEFA (Hagglund et al., 2005a) and FIFA (Fuller et al., 2006).

Statistical methods

Data were processed using Excel (Windows 7) and system *PASW Statistics 18* (SPSS, Chicago, IL. USA.). All quantitative variables were analyzed using a one-way, factorial analysis of variance (ANOVA) and were presented as mean values (SD). The χ^2 test was used to analyze ordinal variables. Injury incidence was expressed as the number of injuries per 1000 h

of exposure and presented with 95% confidence intervals (CI). Significance was set at $p < 0.05$.

RESULTS

Exposure and injury incidence

Table 1 shows the exposure data. The total exposure was 49 343 hours (43 388 training hours and 5 955 match hours).

Table 1: Exposure (h) to training and match in artificial turf and natural grass of senior amateur football players from two different competitive levels during the 2010–11 season (n=251).

Exposure	Regional	3 rd Division		Total
	8 teams, AT	3 teams, AT	1 team, home matches in NG	
Training exposure AT	25 820	12 734	2 465	41 019
Match exposure AT	4 000	1 317	230	5 547
Total exposure AT	29 820	14 051	2 694	46 566
Training exposure NG	0	0	2 370	2 370
Match exposure NG	0	159	248	407
Total exposure NG	0	159	2 618	2 777
Total exposure AT+NG	29 820	14 210	5 313	49 343

AT, artificial turf; NG, natural grass.

During the season, 237 injuries were recorded. One-hundred and forty-nine (57%) of the 261 players suffered injuries: 92 players (35%) had one injury, 38 players (15%) suffered two injuries, 11 players (4%) sustained 3 injuries, 5 players (2%) had 4 injuries, 2 players (0,8%) had 5 injuries, and 1 player (0.2%) suffered 6 injuries.

The mean injury incidence was 5.1(95% CI: 4.3 to 5.8) injuries per 1000 exposure hours (Table 2).

Table 2: Training and match injury incidence [mean (95%CI)] in artificial turf and natural grass of senior amateur football players from two different competitive levels (n=251).

Moment	Regional	3 rd Division			Mean (95% CI)	
	8 teams, artificial turf (AT)	3 teams (AT)	1 team, home matches in NG	Total 3 rd division		
AT	Training Injury incidence	1.7 (1.1–2.6)*	4.3 (2.9–5.7)	0.8 (-0.4–2.0)	3.4 (2.3–4.6)*	2.3 (1.7–2.8)
	Match Injury incidence	24.4 (16.9–32.6)*	51.6 (26.0–77.3)	25.7 (1.2–50.2)	45.2 (25.1–65.3)*	31.6 (23.1–40.2)
	Total incidence	4.2 (3.4–5.0)*	7.4 (5.7–9.2)	2.7 (1.9–51.0)	6.2 (4.8–7.7)	4.9 (4.2–5.6)
NG	Training Injury incidence	0	0	3.0 (0.6–5.4)	3.0 (0.6–5.4)	3.0 (0.6–5.4)
	Match Injury incidence	0	52.0 (-13.4–117.4)	22.2 (-0.3–44.6)	44.6 (-4.5–93.6)	44.6 (-4.5–93.6)
	Total incidence	0	52.0 (-13.4–117.4)	5.0 (0.9–9.0)	40.3 (-8.6–89.2)	13.6 (-2.9–30.0)
Total Injury Incidence	4.2 (3.4–5.0)*	7.7 (5.9–9.4)	3.7 (1.6–5.9)	6.7 (5.3–8.1)*	5.1 (4.3–5.8)	

AT,artificial turf; NG,natural grass.

* Significantly different from regional teams; p<0.05.

Two hundred and twenty injuries (93% of all injuries) occurred on artificial turf and only 17 (7%) on natural grass. However, for the 4 teams of the 3rd division that used the 2 kinds of surface, the total injury incidence was higher in natural grass than in artificial surface: 40.3 (95% CI: -8.7 to 89.2) vs. 6.2 (95% CI: 4.8 to 7.7) injuries per 1000 hours, respectively, but this difference was not statistically significant (p>0.05).

Fifteen percent of all injuries (n=36) were confirmed by complementary exams (21 by radiography, 9 by ultrasonography, and 6 by magnetic resonance imaging). Four players needed surgery, one on pelvis/sacrum (midfielder), one on the wrist (central defender), one on the knee (fullback), and one on the foot/toe (midfielder).

Two hundred and twenty seven injuries (96%) occurred during the competitive period and only 10 injuries (4%) occurred during the preseason. March was the month with the highest occurrence of injuries, followed by February and November. The number of injuries was lower in August, December and May (figure 1).

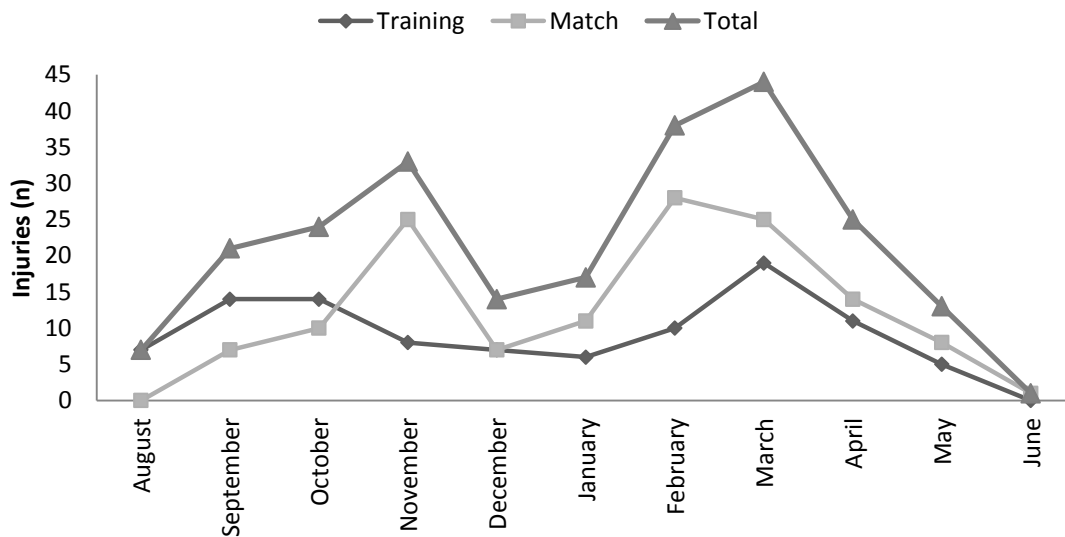


Figure 1: Training and match injuries throughout the season

Match and training injuries

More than a half of the injuries (136, 57%) occurred in matches, and 43% (101) occurred during training sessions. Also, the injury incidence was higher in matches [31.9 (95% CI: 23.7 to 40.2) injuries per 1000 hours] than in trainings [2.4 (95% CI: 1.8-2.9) injuries per 1000 hours]. Both for proportion and incidence of injuries, significant differences ($p=0.023$ and $p<0.001$, respectively) were found between matches and trainings sessions.

The proportion of injuries was very similar among defenders, midfielders and forwards, and differences in training, match, and total incidence between field positions were not statistically significant ($p>0.05$; table 3).

3: Number of injuries and incidence [mean (95%CI)] by field position of amateur football players from two different competitive levels ($n=251$).

Posição	Nr lesões (%)	Incidência média / 1000 h
Goalkeeper	17 (7%)	3.1 (95% IC: 1.6–4.6)
Defender	76 (32%)	5.2 (95% IC: 3.9–6.5)
Mildfielder	71 (30%)	5.2 (95% IC: 3.8–6.6)
Forward	73 (31%)	5.6 (95% IC: 4.2–7.1)

The results regarding match-related injuries are presented in figure 2. Only 1 (0.7%) injury was recorded on the extra-time, and 13 (9.6%) pain cases were reported after the game. Injuries occurred significantly more in the 2nd than

the 1st halves (p=0.011). Additionally, injuries occurred significantly more in the last two 15-min periods of the game than in the others 15-min periods of the match (p=0.025; figure 2).

During training practices, a large majority of the injuries occurred in the main part of the session (89 injuries, 88%). Eight (8%) pain cases were recorded after trainings. Sixty-eight (73%) injuries occurred during small-sided games/playing drills, 21 (23%) during practice/friendly matches, 3 (3 %) in specific fitness exercises, and 1 (1 %) in a technical drills (“footvolley”).

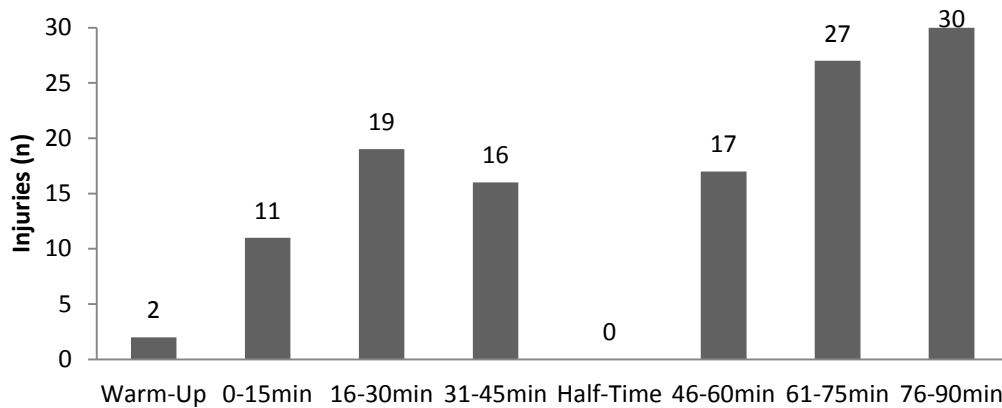


Figure 2: Number of injuries during the course of the match, distributed by 15-min periods, including warm-up and half-time break (n=122)

Location and type of injuries

The majority of injuries affected the lower extremity (202; 85%), followed by upper limbs (16; 6.7%), the trunk (15; 6.3%), and the head/neck (4; 1.6%) (table 4).

Table 4: Number of injuries in each body location per competitive level.

Location	Regional	3rd Division	Total (%)
Head/Neck			
Head/Face	2	0	2 (0.8)
Neck/Cervical spine	1	1	2 (0.8)
Trunk			
Abdomen/Thoracic spine	4	0	4 (1.7)
Pelvis/Lower back/Sacrum	6	5	11 (4.6)
Upper limbs			
Shoulder/Clavicle	3	2	5 (2.1)
Upper arm	1	0	1 (0.4)
Elbow	0	1	1 (0.4)
Forearm	0	1	1 (0.4)
Wrist	3	0	3 (1.3)
Hand/Fingers	5	0	5 (2.1)
Lower limbs			
Hip/Groin	9	11	20 (8.4)
Thigh	26	24	50 (21.1)
Knee	22	26	48 (20.3)
Lower leg/Achilles	5	10	15 (6.3)
Ankle	23	20	43 (18.1)
Foot/Toe	8	18	26 (11.0)
Total	118	119	237 (100.0)

The thigh (50, 21.1%) and the knee (48, 20.3%) were the most affected regions, followed by the ankle (43, 18.1%), and the foot/toe (23, 11%). Head and neck (4, 1.6%) were the least injured sites (table 4).

Overall, sprain/ligament injury was the commonest injury (76, 32%), followed by strain/muscle rupture (57, 24%), and contusion (39, 17%). The most frequent diagnoses were thigh strain/muscle rupture (n = 42), ankle and knee strain/ligament injury (39 and 27, respectively), foot/toe contusion (14), and lower leg strain/muscle rupture (8) (table 5).

Table 5: Location and diagnosis of injuries on the lower limbs

Location	Injury Type	Number
Hip/Groin	Muscle rupture/strain	6
	Unspecified hip/groin pain	6
	Tendon injury	5
	Sprain/ligament injury	2
	Contusion	1
Thigh	Muscle rupture/strain	42
	Contusion	7
	Tendon injury	1
Knee	Sprain/ligament injury	27
	Tendon injury	6
	Lesion of meniscus or cartilage	5
	Contusion	5
	Inflammation	4
	Other bone injuries	1
Lower leg/Achilles	Muscle rupture/strain	8
	Tendon injury	2
	Contusion	2
	Other injuries	2
	Inflammation	1
Ankle	Sprain/ligament injury	39
	Contusion	2
	Other bone injuries	1
	Other injuries	1
Foot/Toe	Contusion	14
	Fracture	4
	Tendon injury	3
	Sprain/ligament injury	2
	Inflammation	2
	Luxation/subluxation	1

Limb dominance

The injuries in the lower extremity affected more the dominant than the non-dominant limb (129 injuries, 65.5% vs. 68 injuries, 34.5%; $p < 0.001$). Injuries that resulted from body-contact situations affected significantly more the dominant limb ($p = 0.002$). Also, injuries that resulted from non-contact situations, including running actions, affected significantly more the dominant than the non-dominant limb ($p = 0.004$).

Severity

The mean time of absence due to injury was 19.7 (95% CI: 16.5 to 22.9). Moderate injuries were more common (94 injuries, 40%), followed by mild injuries (70 injuries, 30%). Fifty-two (22%) injuries were severe, whereas 21 (9%) were minimal injuries.

Severe injuries occurred significantly more in games than in training sessions (63% vs. 37%; $p=0.052$). From all severe injuries, 46% were on the knee, 10% on the foot/toe and 10% on the pelvis/lower back/sacrum. Concerning moderate injuries, 28% were thigh injuries, 20% ankle injuries, and 15% were injuries sited on the knee. Three knee injuries were season-ending injuries.

Mechanism of injury

More than three-quarters of injuries (184, 78%) were traumatic, and 53 (22%) were overuse injuries. From all traumatic injuries, 70 (30%) occurred from non-contact situations, and 23 (10%) in running situations.

Traumatic injuries occurred significantly more in matches than in training sessions (116 injuries, 63% vs. 68 injuries, 37%; $p<0.001$). Overuse injuries occurred more in trainings than in matches, but the differences were not significantly different (33 injuries, 62% vs. 20 injuries, 38%; $p=0.07$).

The main contact mechanism was contact with other player (89, 38%), followed by contact with the surface (31, 13%), with the ball (20, 8%), fall under own body (2, 0.8%), and contact with other object (2, 0.8%). The injuries that resulted from body contact occurred significantly more in matches than in training sessions (59 injuries, 66% vs. 30 injuries, 34%; $p=0.002$). Match injuries occurred significantly more in the 2nd than the 1st half of the match ($p=0.013$). From these 59 match injuries, 20 (34%) were considered foul play, and 39 (66%) were not sanctioned by referees.

The injuries that resulted from contact with other player predominately affected the ankle (25, 28%), the knee (19, 21%), the foot/toe (17, 19%), and the thigh (9, 10%).

Re-injuries accounted for 11% (26) of all injuries sustained during the season. Fifty percent of these injuries happened during matches and the other 50% occurred during training sessions. Seventeen re-injuries (65%) were

traumatic, and 35% of those traumatic injuries happened on non-contact situations. Nine injuries (35%) were due to overuse. Thirty-eight percent of the 26 re-injuries were sprains/ligament injuries, 31% strains/muscle rupture, 12% tendon injury, and 12% unspecified hip/groin pain.

DISCUSSION

The present study was conducted with a prospective design, avoiding the risk of recall bias related to the recording of data, and followed the international consensus agreements on procedures for epidemiological studies of football injuries recommended by FIFA (Fuller et al., 2006) and UEFA (Hagglund et al., 2005a). We conducted an injury surveillance study covering one full football season, which, according to Hagglund, Walden, & Ekstrand (2006), seems to provide a reasonable overview of the injury problem among football players in a specific environment.

The principal findings of this prospective study were the high injury incidence comparing with previous studies carried out with amateur players, as well as the significantly higher injury incidence in 3rd division than in regional level players, both during training and match play. Also, the lower number of injuries during the preseason than during the competition period in both groups has to be highlighted.

Injury incidence

The mean injury incidence (5.1 injuries per 1000 hours) was slightly lower than results found in others studies (Hagglund, Walden, & Ekstrand, 2005b; Hagglund et al., 2006, Hagglund, Walden, & Ekstrand, 2009a; Hawkins & Fuller, 1999; Walden, Hagglund, & Ekstrand, 2005). The injury rate during training (2.4 injuries per 1000 hours) was in the range of that reported elsewhere (Agel, Evans, Dick, Putukian, & Marshall, 2007; Dupont et al., 2010; Ekstrand et al., 2006; Fuller et al., 2007b; Hawkins & Fuller, 1999); whereas the injury rate during matches (31.9 injuries per 1000 hours) was higher than that found in previous studies with amateur players (Kordi, Hemmati, Heidarian, & Ziaee, 2011), college players (Agel et al., 2007; Fuller et al., 2007a), very similar with the values obtained with professional players (Ekstrand, 2008; Hagglund et al., 2005b; Hawkins & Fuller, 1999; Walden et al., 2005), but lower than the injury rate reported in international tournaments (Dvorak, Junge, Derman, & Schwellnus, 2011; Dvorak, Junge, Grimm, & Kirkendall, 2007; Hawkins & Fuller, 1996).

In our study, 57% of the players (149 injured players) incurred 267 injuries, which is similar to reports from previous studies (Arnason et al., 2004a;

Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2008), but lower than others (Hagglund et al., 2005b, Hagglund et al., 2009a). Nevertheless, we need to enhance the higher percentage (22%, 57) of players that had more than one injury during the season.

Distribution of injuries throughout the season

To our knowledge, this is the first study that had analyzed the distribution of injuries during the season in amateur football players. It has been reported that during the preseason period players are at a greater risk of sustaining slight and minor injuries, and overuse injuries (Woods, Hawkins, Hulse & Hodson, 2002). Previous studies (Hawkins, Hulse, Wilkinson, Hodson, & Gibson, 2001) found that training injuries peaked during July (preseason period), whereas match-related injuries peaked at the start of the competitive season (in August). In the present study, we have only recorded 10 (4%) injuries during the preseason, and the majority (227, 96%) of injuries occurred during the competitive period. Our findings are in line with the observations reported by one study with professional players, which found that 13% of injuries occurred in the preseason, as well as a higher incidence of injuries during the competitive period, especially in the last part of the season, when teams were involved in the play-offs (Morgan & Oberlander, 2001). Also, one study carried out in Czech Republic during one season, running from July to May (Chomiak, Junge, Peterson, & Dvorak, 2000), reported that nearly half of all severe injuries (both traumatic and overuse) were registered during the autumn competitive season, while a lower number of injuries occurred during the winter preseason, spring season, and summer preseason. In another study regarding preseason injuries, involving 912 young Portuguese football players (Brito et al., 2011), it was shown that only 7.2% of players sustained an injury. However, it should be acknowledged that the lower proportion of injuries during the preseason period might be explained by the fact that this period is very short comparing with the competitive period.

In the present study, March was the month with the highest occurrence of injuries, followed by February and November. This can be explained by the fact that in February and March the championships were in the final decisions, and the intensity of play might be higher than in others periods of the season

(Morgan & Oberlander, 2001). Also, the higher number of injuries in November might be explained by the fact that the weather starts to get worst due to the rains and therefore the characteristics of the pitches change. Thereby, players might need to adapt the play to the field conditions. In young elite players, it has been reported that match injuries were sustained more frequently between September and April (except January), which was the competition period (Cloke, Spencer, Hodson, & Deehan, 2009). Additionally, another study regarding the incidence of groin injuries throughout seven seasons (running from July to May) showed that March was the month with the highest injury incidence, followed by October and November (Werner, Hagglund, Walden, & Ekstrand, 2009).

In our study, the majority of the teams started the trainings in the third or fourth week of August, and ended around May. The players suffered fewer injuries in August, December and May. The lower number of games and trainings during Christmas time can explain the fewer injuries in December. Also, the lower number of injuries observed in May might be a result of the fact that only six clubs continued training and competing after May 8, and this is in line to that found in others studies, showing lower injuries at the end of the season (Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005).

Game and training injuries

In the present study, injuries occurred significantly more in matches than in trainings, and therefore the injury incidence was significantly higher during matches than during practice sessions. Previous studies also showed higher incidences during matches than during trainings (Agel et al., 2007; Dupont et al., 2010; Hagglund et al., 2005b; Tsiganos, Sotiropoulos, & Baltopoulos, 2007), as a result of greater physical, psychological, and mental demands during matches comparing with practice sessions (Hagglund et al., 2005b).

We found that during the match, injuries occurred significantly more during the 2nd than during the 1st half, which supports the reports by Hawkins & Fuller (1996; 1999), and Hawkins et al. (2001). Interestingly, during the 2nd half, injuries occurred significantly more in the last thirty minutes of the game. This is in agreement with previous studies (Hawkins & Fuller, 1999; Tsiganos et al., 2007), and therefore supports the idea of fatigue as a risk factor mainly in the

closing period of the matches (Rahnama, Reilly, & Lees, 2002). However, and in contrast with others studies (Hawkins & Fuller, 1999; Hawkins et al., 2001), we did not find a higher incidence of injuries in the last fifteen minutes of the first half.

Competitive level

In the present study, the incidence of injuries, both in matches and practices, was significantly higher in 3rd division than in regional level players. This is in line with the results observed in other studies (Agel et al., 2007; Azubuike & Okojie, 2009; Ekstrand, Walden, & Hagglund, 2004b; Woods et al., 2004), and might reflect the highest intensity of trainings and games, as well as the highest aggressiveness of play among 3rd division teams. According to Murphy, Connolly and Beynnon (2003), higher skill-level teams may play at a more aggressive intensity than those with lower skill levels, thereby increasing the risk of injury. Further studies should therefore attend on differences in match and training intensity, and aggressiveness, between different competition levels in soccer.

Playing position

We found a similar proportion of injuries among defenders, midfielders and forwards, while goalkeepers had a lower proportion of injuries. These values are in accordance to those reported by others studies (Hawkins & Fuller, 1998; Morgan & Oberlander, 2001; Woods et al., 2002).

Surface type

In the present study, a higher proportion of injuries occurred on artificial turf, because all the teams, except one, trained and played the matches in this surface. Only one team of the 3rd division level played all the home matches on natural grass, whereas the other 3 teams of this competition level played 2 or 3 away matches on natural grass during the season. Interestingly, these 3 teams presented a very high injury incidence in the matches played in natural grass, namely 52.0 injuries per 1000 hours of exposure. This might suggest that changes on playing surface could be a risk factor for injuries in football. Therefore, future studies should investigate this important aspect with a larger

sample, because the sample size of 3rd division teams was limited and statistically too small to reliably identify the changes of surface as factor risk.

Location and type of injuries

The majority of injuries affected the lower extremity (85%), which is similar with the results observed elsewhere (Andersen, Tenga, Engebretsen, & Bahr, 2004; Arnason et al., 2004a; Dvorak et al., 2011; Hassabi et al., 2010; Poulsen et al., 1991). The most common injury locations were the thigh and the knee, followed by the ankle, which supports the reports with professional players (Hawkins et al., 2001; Walden et al., 2005). However, the results of the present study differed from previous reports with amateur and college players, that observed more ankle than knee injuries (Fuller et al., 2007a, 2007b; Tsiganos et al., 2007), and a higher number of ankle and knee injuries than thigh injuries (Kordi et al., 2011). Nevertheless, all the studies agreed that the commonest injuries among amateur football player are the thigh, knee and ankle injuries, with differences in the exact proportions and prevalence. Therefore, the high rate of lower-extremity injuries suggests the need for increasing the amount of injury prevention training, as the incidence of football injuries can be reduced by preventive interventions, namely football-specific balance training and proprioceptive training program (Kraemer & Knobloch, 2009). Also, coaches and players need better education regarding injury prevention training, and should include such strategies as part of their regular training (Junge, Rosch, Peterson, Graf-Baumann, & Dvorak, 2002).

According to the literature, the most common types of injuries in football are sprains, strains and contusions, and that was confirmed in our investigation, as 32% of injuries were sprain/ligament injuries, 24% strain/muscle ruptures, and 17% were contusions (Junge & Dvorak, 2004).

The most frequent diagnoses were thigh strain/muscle rupture, followed by ankle strain/ligament injury, and knee strain/ligament injury, which is in agreement with previous studies conducted with professional players (Arnason et al., 2004a; Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005), but different from results observed with college and amateur players, that showed more ankle and knee sprains than thigh strains (Agel et al., 2007; Kordi et al., 2011). In a 5-year longitudinal study with professional players, Ekstrand

(2008) found that injuries to the thigh muscles were the single most common injury sub-type. Additionally, Ekstrand (2008) observed a lower risk of ankle sprains and a need for a shorter rehabilitation period after injury, which suggests that top-level teams have a thorough knowledge of optimal treatment and prevention of ankle sprains. Therefore, the higher proportion of ankle sprains found in our study might suggest that amateur teams should improve their knowledge about prevention and treatment of this type of injury.

Limb dominance

As in other studies (Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001), injuries in the lower extremity affected significantly more the dominant than the non-dominant side. Also, injuries resultant from both body contact and non-contact situations affected significantly more the dominant limb, which is in accordance with results found by others (Brophy, Silvers, Gonzales, & Mandelbaum, 2010; Faude et al., 2006). This might confirm that the dominant lower limb is at increased risk of injury, mainly because it is preferentially used for kicking, pushing off, jumping, or landing (Murphy et al., 2003), and also because it is the main point of attack on the player who is in possession of the ball (Faude et al., 2006).

Severity

The mean time of absence due to injury has been reported to range between 10 to 24 days (Hagglund et al., 2005b; Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001). Therefore, our results (19.7 days of absence) are in the range of those previous studies.

We recorded more moderate injuries (8–28 days) and mild injuries (4–7 days), which is in line with reports from others (Azubuike & Okojie, 2009; Hawkins et al., 2001). Several studies observed that severe injuries are least common in soccer (Dupont et al., 2010; Ekstrand, 2008; Fuller et al., 2007a, 2007b; Hagglund et al., 2005b; Walden et al., 2005), but in the present study we recorded more severe than minimal injuries. In a recent study investigating the injury incidence among male and female elite soccer players, Hagglund et al. (2009a) found a higher proportion of moderate and severe injuries in female than in male players. According to the authors, this might be explained by

several reasons: the female players have a regular job besides soccer; the medical support is lower in the female clubs and a delayed diagnosis and/or less optimal rehabilitation of injured players could lead to more severe injuries; the number of players, and especially high-skilled players, in a squad is often lower in female clubs meaning that they have less possibility to rotate players and avoid over-matching; and finally, defining injury severity by the number of days lost from football means that factors such as player motivation, time of season, importance of a specific match, etc., could influence the results. We can corroborate with some of these reasons to explain the higher proportion of severe than minimal injuries observed in our study, since all the players in our study had regular job besides football, and it is plausible that the relative importance of a specific match associated with a poor rehabilitation process could have lead to more severe injuries.

Previous studies have demonstrated that severe injuries affect predominantly the knee (Agel et al., 2007; Arnason et al., 2004a; Walden et al., 2005; Walden, Hagglund, & Ekstrand, 2006), and this was confirmed in the present study. It has been suggested that structured training programs that emphasize neuromuscular and proprioceptive training offer encouraging evidence for the prevention of knee injuries (Junge & Dvorak, 2004). Therefore, we suggest that amateur teams should give further attention to neuromuscular and proprioceptive training as a mean to prevent knee injuries.

Mechanism of injury

The proportion of traumatic (78%) and overuse (22%) injuries observed in this investigation was similar to the values reported previously (Arnason et al., 2004a; Hagglund, Walden, & Ekstrand, 2009b; Poulsen et al., 1991). The high number of traumatic injuries reflects the characteristics of the sport (Jacobson & Tegner, 2007). As in other studies (Azubuike & Okojie, 2009; Fuller et al., 2007a, 2007b; Hagglund et al., 2009b; Hassabi et al., 2010), traumatic injuries occurred more in matches than in training sessions, but to our knowledge only in our study, and in the study from Hagglund et al. (2009b), this difference was statistically significant. On the other hand, overuse injuries tended to occur more in training sessions than in matches, but the lack of

statistical significant on this difference is similar to that observed elsewhere (Agel et al., 2007; Hagglund et al., 2005b).

The main contact mechanism was contact with other player, with a proportion of 38%, which is in the line to levels (38–63%) reported previously (Azubuiké & Okojie, 2009; Hagglund et al., 2009b; Hassabi et al., 2010; Hawkins & Fuller, 1999; Hawkins et al., 2001; Kordi et al., 2011). We found that contact with other player occurred significantly more in matches than in training sessions. During the matches, injuries resultant from player-to-player contact occurred significantly more in the 2nd than in the 1st half, which corroborates the reports for elite players (Hagglund et al., 2009b). Contact injuries were more common in the 2nd half, possibly due to fatigue and a lack of concentration on match play towards the end of a match (Arnason, Tenga, Engebretsen, & Bahr, 2004b). It is also plausible that the intensity and frequency of contact situations is greater towards the end of the match, when players increase their efforts to achieve the goals defined to the match (Arnason et al., 2004b; Hagglund et al., 2009b).

From the 59 injuries resultant from player-to-player contact, 34% were considered foul play, which is in line with the values reported previously (15–57%) in studies with clubs and national teams (Dvorak et al., 2007; Hagglund et al., 2005b, 2009a, 2009b; Hawkins & Fuller, 1998; Walden et al., 2005).

Re-injuries

Return to activity prematurely, and inadequate rehabilitation have been previously reported as injury risk factors, and a proportion ranging 7–30% of re-injuries has been recorded elsewhere (Ekstrand et al., 2006; Hagglund et al., 2005b; Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005). Therefore, the proportion of recurrent injuries observed in the present study (11%) was in the range of that reported previously. Thirty five percent of the re-injuries were due to overuse, whereas 65% were traumatic (35% resulted from non-contact situations). In most studies (Ekstrand et al., 2006; Hagglund et al., 2005b; Hawkins & Fuller, 1999; Hawkins et al., 2001; Walden et al., 2005), re-injuries occurred more in training sessions than in matches, but in our study half of the recurrent injuries occurred in matches, and another half in training sessions. According to Hawkins and Fuller (1999), a higher level of re-injuries in

trainings than in matches suggests that several re-injuries might occur during the rehabilitation process, but high proportion of re-injuries during matches observed in the present study suggest that several players might not be completely prepared to face the match demands after a recovery period.

Conclusion

The present study showed that the injury incidence was high in amateur soccer players during competition. Also, the incidence of injuries, both in matches and practice sessions, was significantly higher in 3rd division than in regional level players. Overall, the most common injury locations were the thigh and the knee, followed by the ankle. The most frequent diagnoses were thigh strain/muscle rupture, followed by ankle strain/ligament injury and knee strain/ligament injury. A higher proportion of injuries were traumatic, and the main contact mechanism was contact with other player, occurring significantly more in matches than in training sessions. The mean time of absence due to injury was 19.7 days. We recorded more moderate injuries (8–28 days) and mild injuries (4–7 days), and severe injuries affected predominantly the knee.

Interestingly, the present study suggests that changing the playing surface could be a risk factor for injuries in soccer, since the teams that played both in natural and artificial grass during the season had a higher injury incidence. Future studies should therefore investigate the changes on surface of play as a risk factor for injuries in soccer, with a larger sample, because the sample size in this study was limited and statistically too small to reliably identify the changes of surface as risk factor of injuries in amateur soccer players.

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