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Original research

The incidence and nature of injuries sustained on grass and 3rd generation artificial turf: A pilot study in elite Saudi National Team footballers

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ABSTRACT

Purpose of the study: To compare the incidence, severity and nature of injuries sustained by Saudi National Team footballers during match-play and training on natural grass and 3rd generation (3G) artificial turf.

Method: Injury data was collected on all Saudi National Team players competing at the Gulf Cup (Yemen December 2010: 3G) and the Asian Cup (Qatar January 2011; grass). A total of 49 players were studied (mean ± SD; Age 27 ± 4 yr; body mass 71.4 ± 6.7 kg; height 176.8 ± 6.3 cm; professional playing experience 9 ± 3 yr) of which 31 competed at the Gulf Cup, 32 at the Asian Cup (14 at both). A prospective cohort design was used to investigate the incidence, nature and severity of injuries sustained with data collected using a standardised injury questionnaire. All data were collected by the team physiotherapist with the definition of injury set at any injury that required player and clinician contact. Injury and exposure data were collected and reported for games, training and all football activity.

Results: A total of 82 injuries [incidence – 56.1 per 1000 h total game and training exposure] were recorded at the Asian Cup (grass) and 72 injuries [incidence – 37.9 per 1000 h total game and training exposure] were recorded at the Gulf Cup (3G). Incidence data for training, game and all football exposure injury rates were higher when playing on grass. The vast majority of injuries on both surfaces were very minor that, whilst requiring medical attention, did not result in loss of match/training exposure. Injuries that resulted in 1–3 days absence from training or game play had similar incidence rates (Grass: 7.4 vs. 3G: 7.4 injuries per 1000 h exposure). More severe injuries were less frequent but with a higher incidence when playing on grass. Lower limb injuries were the most common in both tournaments with a higher incidence on grass (Grass: 14.2 vs. 3G: 7.9 injuries per 1000 h exposure). Muscle injuries were the most frequent of all injuries with similar incidence rates on both surfaces (Grass: 5.4 vs. 3G: 4.7 injuries per 1000 h exposure). Injuries that involved player contact were also more common on grass (Grass: 11.5 vs. 3G: 3.2 injuries per 1000 h exposure).

Conclusion: Whether reporting all injuries or just those that prevented players from taking part in training or match play, injury incidence rates were generally higher when Saudi National Team footballers played on grass than on 3G artificial surface. Although this is a small study, the unique quasi-repeated measures study design with elite Saudi National Team footballers, adds to the current belief that 3G artificial turf does not increase injury risk in football.

1. Introduction

Football is played globally in a variety of environmental conditions and on many different playing surfaces (Ekstrand & Nigg, 1989) and the popularity of football, recreationally and professionally, may partially explain the high injury incidence observed in football compared to other sports and occupations (Ekstrand, 1982; Hawkins & Fuller, 1999). Injuries to football players, irrespective of their geographic location and level of performance, can impact health as well as presenting an economic burden to the individual and/or medical organisations (Hoy, Lindblad, & Terkelsen, 1992).

To date, limited football injury data has been collected in Asia (Yoon, Chai, & Shin, 2004) with no systematic collection of injury information undertaken in Saudi Arabia. Injury prevalence and

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pattern may differ as a consequence of the geographical area in which the data is recorded (Cumps, Verhagen, & Meeuesen, 2007; Fuller et al., 2006; Junge & Dvorak, 2000). This may be mediated by differences in ability, physical profiles, training and match loads and environmental conditions (Al-Hazzaa, Almuzaini, & Al-Refaee, 2001; Chin, Lo, Li, & So, 1992). This would indicate that country specific statistics are required to accurately understand the injury patterns among specific playing populations.

Most national and international football games (e.g. World Cup) are played on natural grass. With widening participation in football there are some social and environmental conditions that may preclude the use of such playing surfaces. In these cases football matches can be played either indoors or outdoors on artificial surfaces. The impact of playing surface on injury data has been of interest to many sports such as American Football (Hagel, Fick, & Meeuwisse, 2003; Meyers & Barnhill, 2004), Rugby (Fuller, Clarke, & Molloy, 2010) but more commonly football (Aoki et al., 2010; Arnason, Gudmundsson., Dahl, & Johannsson, 1996; BjØrnboe, Flørenes, Bahr, & Anderson, 2010; Ekstrand, Hagglund, & Fuller, 2010; Ekstrand & Nigg, 1989; Ekstrand et al., 2006; Fuller, Dick, Corlette, & Schmalz, 2007; Fuller, Randall, Corlette, & Schmalz, 2007; Renstrom, Peterson, & Edberg, 1977; Soligard, Bahr, & Andersen, 2010; Steffen, Andersen, & Bahr, 2007). To many playing dynamic, contact sports on artificial surfaces would likely raise the risk of injury. Renstrom et al. (1977) reported injury data from a 2-year study in Sweden, when the first artificial surfaces were introduced, and observed an increased injury rate when playing on artificial turf in cleated boots. Similarly, Arnason et al. (1996) observed a significantly higher injury risk on artificial turf than on natural grass (25 vs. 10 injuries per 1000 h of exposure).

Current knowledge of the risks associated with artificial surfaces is complicated by continuing developments in artificial surfaces. Negative experiences with "first-generation" artificial surfaces prompted many technical developments that have resulted in the current third generation (3G) artificial surfaces. Introduced in the 1990s, 3G pitches are made of long (40 mm) and widely spread fibres of polypropylene or polyethylene filled with rubber granules. These developments are thought to more closely replicate the playing characteristics of natural turf. Initial studies of injury data on 3G pitches in Norway have concluded that the overall injury risk is similar between natural grass and 3G artificial turf (BjØrnboe et al., 2010; Steffen et al., 2007). These trends were recently confirmed in a broader review (Williams, Hume, & Kara, 2011) although, interestingly, in female footballers the risk of serious injury in match conditions and the risk of ankle injuries were slightly higher on the 3G artificial surface (Steffen et al., 2007). It would seem that further research is required to extend our knowledge of the impact of playing surface on football injuries.

Whilst injury data from football tournament play is available (e.g. Dvorak, Junge, Derman, & Schwellnus, 2011; Dvorak, Junge, Grimm, & Kirkendall, 2007; Hägglund, Waldén, & Ekstrand, 2009), to the best of the author's knowledge, no studies have yet evaluated injury risk on different artificial surfaces in an International team during tournament play. Similarly, data on the impact of playing surface on football injuries has not been gathered in an Asian/Arabic setting. Consequently, the aim of the current study was to examine the prevalence and nature of injuries associated with playing football on 3G artificial turf compared with natural grass in the Saudi National Football Team. This was achieved in a quasi-experimental design involving data collection at two international football tournaments played on different surfaces involving many of the same National team players.

2. Methods

2.1. Subjects

This study assessed injury statistics for Saudi National Football team players competing at the Gulf and Asian Cup tournaments. These tournaments occurred in December 2010 and January 2011, respectively. The coaching and medical support staff was the same and a number of the players competed in both competitions. This provides a relatively unique opportunity to limit the influence of a number of factors that may affect injury incidence in the elite football player. One unique difference was that games and training at the Gulf Cup were completed on 3G artificial turf and games and training at the Asian Cup were completed on natural grass. This unique set of circumstances allowed us to collect injury statistics prospectively in a quasi-repeated measures fashion to compare data from a natural grass exposure against a 3G artificial turf exposure in elite International footballers. In this design as much of the between subject differences has been controlled as is likely possible when working with elite team sports. Data for local environmental conditions were not recorded but average December temperature and relative humidity for Yemen in December is 28 °C and 70% whereas the average January temperature and humidity in Qatar is 23 °C and 90%.

Overall 49 Saudi National Team players (mean ± SD; Age 26 ± 4 yr; body mass 71.4 ± 6.7 kg; height 176.8 ± 6.3 cm; professional playing experience 9 ± 3 yr) were recruited to the study. Of these, 31 trained and played at and in the lead up to the Gulf Cup, 32 trained and played at and in the lead up to the Asian Cup. Fourteen players competed in both tournaments. Whilst only 23 players are allowed at the actual Gulf and Asian Cup tournaments a bigger squad completed pre-tournament training and warm-up games that were on the same playing surface as the specific tournament. This larger cohort was retained for data analysis to give a larger sample and reflect the true call on medical services in the run-up to and during tournament play. National Federation agreement for the completion of the investigation, as well as institutional ethical approval and informed consent were all obtained prior to the study. The only inclusion criterion was selection to the competition squad and there were no exclusion criteria, as players with current injuries were not selected.

2.2. Design

A prospective cohort design was used to investigate the incidence, nature and severity of injuries sustained during training and games in Saudi National Team players. Before and at the Gulf Cup (Yemen) 31 players completed 54 practice sessions with a mean duration of 64 ± 23 min. Seven preparation and competitive games were played so that; games (6930 min), training (107,136 min), and total exposure (114,066 min) were calculated (Table 1). All games and training were completed on 3G artificial turf. Before and at the Asian Cup (Qatar) 32 players completed 48 practice sessions with a mean duration of 54 ± 26 min. Six preparation and competitive games were played so that; game (5940 min), training (82,944 min), and total exposure (88,884 min) were calculated (Table 1). All games and training were completed on natural grass. All individual exposures to training and matches were recorded on a group or player-by-player basis during the data collection period by the lead author on a standard proforma (Fuller et al., 2006).

2.3. Data collection

All injuries were recorded during National Team training camps and competitive matches in both the Gulf Cup and the Asian Cup by