An Overview of Injuries in Senior Women’s Football in Malta

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Abstract: The incidence of football injuries may be double the amount of injuries happening in sports such as basketball, and is estimated to range from 10 to 35 injuries per 1000 game hours. This high risk of injuries in football is evident in professional, amateur and recreational levels. Despite the significant increase in female participation as well as the well-known injury risks, research on women football players is very limited as most studies are still focusing on injuries experienced by the male gender there has been little research on injuries sustained by female football players. Purpose: Analysis of the incidence, characteristics and circumstances of injury in elite female football players in top-level international tournaments. Study design: Prospective survey. Methods: Injuries incurred in seven international football tournaments were analysed using an established injury report system. Doctors of all participating teams reported all injuries after each match on a standardised injury reporting form. The mean response rate was 95%. Results: 387 injuries were reported from 174 matches, equivalent to an incidence of 67.4 injuries/1000 player hours (95% CI 60.7 to 74.1. Considering the gap existing in the field of applied research, this study has explored the rate of injuries in senior women football players in Malta. It has also looked at the underlying causes of these injuries during the 2018/2019 season. Ethical clearance was obtained from the Ethics Board within the Malta College of Arts Science and Technology, and permission was granted by the Malta Football Association. The sample was made up of 100 participants from 111 players over 16 years of age, within the 120 entire population of senior women football players in Malta. Data was collected through a self-designed online questionnaire which was first validated by three field professionals and then distributed to the participants. Statistical tests (inferential statistics) were used to identify relationships between variables. The Pearson correlation test was utilised to measure the existence and strength of a linear relationship between two variables.

The study found that during the 2018/2019 season, in the BOV Women’s League in football, 63% of the players reported to have suffered at least one injury. With 88.89% of the strikers being injured, this position was seemingly, the one putting players at the highest risk for injury. While it was clear that the majority of injuries occurred during games (53.5%), the knee (35.3%) and ankle (34.1%) were the body part mostly injured, and ligament sprains (60.4%) were the highest type of injuries. The results of this study, contradict existing literature, and found that a negative coefficient with a weak correlation was obtained for both age (r = -0.098) and mass (r = -0.043) when correlated to the number of injuries.

Keywords: Football, Malta football, women injuries, amateur, injury prevalence.
Introduction

The recognition of football as the most popular sport in the world (Henakaarachchi et al. 2017) may have surely had an influence on the increased popularity of women's football, which has seen enrolment notably increasing at a very high rate in the last decades (Bizzini et al. 2008). The physiological demands of the game (Woods et al. 2002) have an increasing effect on the risk of injury. These injuries carry an important burden which is very much influenced by the population at risk (Hespanhol Jr. et al. 2015) and which consequently does influences the player, as well as the coach, technical and medical staff, the club, the association (Hägglund et al. 2013) and the game itself. Despite the significant increase in participation as well as the well-known injury risks, research on women football players is very limited, since most studies are still focusing on injuries experienced by men (Junge and Dvorak 2007) and there has been little research on injuries sustained by female football players. Purpose: Analysis of the incidence, characteristics and circumstances of injury in elite female football players in top-level international tournaments. Study design: Prospective survey. Methods: Injuries incurred in seven international football tournaments were analysed using an established injury report system. Doctors of all participating teams reported all injuries after each match on a standardised injury reporting form. The mean response rate was 95%. Results: 387 injuries were reported from 174 matches, equivalent to an incidence of 67.4 injuries/1000 player hours (95% CI 60.7 to 74.1. This void is without any doubt reflected in the Maltese scene up to date.

For this reason, this study aims to fill in this gap, by answering the following research question:

What was the rate of injuries in senior Maltese women football players and what were the underlying causes of these injuries during the 2018/2019 season?

By answering this research question, this study shall be providing an overview of the injuries occurring in Malta's senior women's football in Malta in the 2018/2019 season. Through a comprehensive investigation on the rate of injuries and the trends leading to such injuries, this overview, will provide a realistic picture of the injuries sustained and their contributing factors, with the aim to generate awareness and indirectly assist in the reduction of injuries in the future. The main objectives of this study are to:

- identify the actual amount of injuries in 2018/2019 season;
- identify the most affected body parts and most frequent types of injuries;
- assess whether extrinsic factors such as surface and shoes have contributed to injuries;
- assess whether age has affected the frequency and severity of injuries;
- assess whether players were mostly injured during training sessions or during a game;
- identify the main causes of injury;
- assess which positions of play were mostly prone to injury.
Literature Review

Football is a highly athletic sport which involves rapid acceleration and deceleration, single stance ballistic movements, twists and aerobatic moves (Woods et al. 2002). These demands on the body may lead to injuries especially in the lower extremities. It has been, in fact, estimated that the overall risk of injury in professional football is about a thousand times higher than typical occupations generally considered at high risk. The incidence of football injuries is estimated to range from 10 to 35 injuries per 1000 game hours (Hägglund et al. 2009). Olson et al. (2011) confirm that football is the leading source of sport-related injuries, with its injury rate being twice that of basketball. This high risk of injuries in football is evident in professional, amateur and recreational levels (Bizzini et al. 2013). Injuries are a crucial component of the footballers’ life and therefore it is essential to be aware of the factors that lead to these injuries. Up to the publication of this study, the authors did not come across any study which focuses on the matter in Maltese football. This leaves the Malta Football Association, its clubs and all members involved without any set benchmark to start working on preventing and reducing injuries in Malta women’s football.

Women’s football in Malta

The 2018/2019 BOV Women’s League included, eight participating teams, namely Birkirkara, Mgarr United, Kirkop United, Raiders, Hibernians, Mosta, Fgura United and Swieqi (Malta Football Association 2020a). Due to Fgura United dropping out a year later, during season 2019/2020 (while data was being collected retrospectively on the 2018/2019 season) there were seven Maltese teams taking part in the league and all of them played against each other in one division (Malta Football Association 2020b).

The physical effects of sports

Participating in sports is associated with a better quality of life and is known to decrease the risk of various diseases when performed regularly. On the other hand, inactive individuals are at a higher risk of obesity and coronary heart disease (WHO 2009). Hence, practising football is an extremely effective way to keep healthy, improve metabolism, cardiovascular and musculoskeletal parameters, and defend the body against diseases; however, it also brings about a high risk of injury (Bizzini et al. 2013; Krstrup et al. 2010). Indeed, athletes sustain various injuries including soft tissue, ligament, bone, tendon and nerve injuries as a result of direct impact or repetitive stress. Factors such as age, gender, level of activity and the type of sport played bring with them different patterns and types of injuries (Maffulli et al. 2011).

Injuries in football

Injuries in football include any physical complaint sustained by a player, resulting from either a football match or training. Injuries would normally require medical attention and/or time away from football activities. An injury that results in a player receiving medical attention is referred to as a medical attention injury, whilst an injury that results in a player being unable to fully participate in future football training or matches as a time loss injury (Fuller et al. 2006). While a time loss injury would not necessarily require medical attention, it is normally expected that a medical attention injury leads to time loss as well.
For professional athletes, incurring sport injuries can be both physically detrimental as well as harmful for their careers. Indeed, injuries can have significant repercussions for the injured athlete. Apart from the monetary expense related to treatment and the time spent away from the sport itself, there is also a significant chance of the said injury to lead to osteoarthritis (Bahr and Krosshaug 2005) as these injuries can have serious consequences for the athlete with a greatly increased risk of early osteoarthrosis. Using specific training programmes, it may be possible to reduce the incidence of knee and ankle injuries. However, it is not known which programme components are the key to preventing knee and ankle injuries or how the exercises work to reduce injury risk. Our ability to design specific prevention programmes, whether through training or other preventive measures, is currently limited by an incomplete understanding of the causes of injuries. A multifactorial approach should be used to account for all the factors involved—that is, the internal and external risk factors as well as the inciting event (the injury mechanism). Therefore prevention of sports injuries is vital (Krosshaug 2014). This is where sports medicine is essential as it aids each player to be in the healthiest form possible. Unfortunately, clubs do not always consider this as being essential, as for them, positive results—ideally wins—are a priority (Eirale and Ekstrand 2020). However, one should certainly realise that reduction of the frequency of injury would be an effective method to reach set goals. It is also necessary for coaches, who are responsible for the planning of training programmes and for the safety culture promoted within the club, to show awareness and knowledge about injuries (Woods et al. 2002). In order to prevent or reduce injury incidences, injury surveillance is the first essential step (Eirale and Ekstrand 2020).

Injury prevalence in football

Current literature clearly shows that lower limbs injuries have the highest prevalence in football. The Union of European Football Association (UEFA) reported that during the Champions League: hamstring injuries, groin injuries, ankle sprains, knee/leg contusions, quadriceps injuries, calf injuries, lumbar/thoracic injuries, hip/thigh contusions, medial collateral ligament (MCL) sprains in the knees and Achilles tendon injuries are the ten most occurring injuries, with the order reflecting the frequency of the injury respectively (Hagglund and Waldén 2012). Eirale and Ekstrand (2020) found that thigh strains and knee injuries (in most cases the latter being anterior cruciate ligament, ACL, injuries) are the most common injuries occurring in football. They also claim that although hip and groin injuries are often underestimated, yet still very common. These lower limb injuries, which can be strains (42%), sprains (29%), contusions (19%), lacerations (7%) and fractures (3%), have been found to contribute to 84% of all football injuries (Henakaarachchi et al. 2017). In recent studies, ankle injuries, very common injuries in sports in general, have decreased by 50% in football in comparison to reports from previous studies (Eirale and Ekstrand 2020).

The major reasons for injury in young football players were found to be collision, running, tackling and landing, respectively (Sentsomedi and Puckree 2016)31 (36.5%). Contact injuries do indeed seem to be more common than non-contact ones. Junge and Dvořák (2015) equivalent to an incidence of 1.68 injuries per match (95% CI 1.36 to 2.00) also found that injuries were a consequence of contact with another player, while non-contact injuries were minimal (16%).

Eirale and Ekstrand (2020) found that injuries are five times more likely to occur during games when compared to training. This contradicts Kumar et al. (2008), who found that
57.41% of injuries happen during training. Men were found to run a higher risk of getting injured both in matches and training sessions. However, risk is equal between men and women, when considering only sustained injuries (injuries that last more than a week in terms of absence) (Eirale and Ekstrand 2020). When it comes to knee injuries, however, the authors found that women football players run a higher risk. In fact, women football players have a two to three times higher chance of getting an ACL injury. The difference in hormones, anatomy, neuromuscular activation, femoral notch and core stability can be few of the reasons behind this difference in injury prevalence between these two genders (Lewis 2000). Figure 2.1 shows a list of the most common types of injuries women soccer players may incur (Shmerling 2015; Wick 2016).

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle Sprain</td>
<td>Very common among males and females</td>
</tr>
<tr>
<td>Shoulder Issues</td>
<td>Examples are rotator cuff muscle injury and instability in the shoulder</td>
</tr>
<tr>
<td>Knee Injuries</td>
<td>Most common for women is the Patellofemoral syndrome – inflammation under the knee cap and issues in ligaments such as tears in the anterior cruciate ligament (ACL).</td>
</tr>
<tr>
<td>Stress Fractures</td>
<td>Most common in lower leg or foot. May arise from insufficient calories and nutrient intake, bone loss and also irregular menstrual periods. These are very common among female athletes.</td>
</tr>
<tr>
<td>Plantar Fasciitis</td>
<td>Flat feet and abnormal foot alignment contribute to tears of the supporting tissues along the heel and the arch.</td>
</tr>
<tr>
<td>Concussion</td>
<td>More common among women due to differences in neck musculature - women develop less muscles than men.</td>
</tr>
</tbody>
</table>

Figure 2.1 – Most common types of injuries (adapted from Shmerling 2015; Wick 2014)

Prevalence per playing Positions

While Faude et al. (2006), concluded that due to the fact that they engage in fierce actions, defenders and strikers are those running the highest chance of injury, Almeida et al. (2013), found midfielders to be those running the highest risk of injury. On the other hand, goalkeepers have been found to have the lowest incidence rate of injury among genders, both during training and matches (Almeida et al. 2013; Hägglund 2007). Hägglund (2007), claims that this could be due to the fact that goalkeepers may have a lower exposure to high risk manoeuvres such as tackles, challenges for the ball, and contact with other players. Furthermore, this could also be due to the fact that goalkeepers have a lower exposure time (Nilstad 2014) as they are most likely the ones with the least time in contact with the ball, when compared to all the other positions.

Risk Factors

Risk factors are those factors, or elements, that in this case increase the chance of developing an injury. Whilst, risk factors are frequently presented independently, in practice they do not happen alone but usually interact and co-exist with one another. Risk factors can be categorised as intrinsic or extrinsic, modifiable and non-modifiable (Emery, Meeuwisse et al. 2005). Intrinsic factors are those individual features that may
affect the particular player, leading to an injury. On the other hand, extrinsic factors are more dependent on the kind of activity undertaken in the course of the incident of injury (Nilstad 2014).

**Intrinsic risk factors**

While there is no consensus on how age affects injury, it is still considered a main intrinsic factor that leads to injuries in football players. While Söderman et al. (2001) found no link between age and injuries, Östenberg and Ross (2000) identified players older than 25 as incurring the greatest possibility of sustaining an injury. Similarly, among men football players aged between 16-38, Arnason et al. (2004) observed that the older the players, the higher the risk of injury. Ergün et al. (2013)injury incidence increased during matches and decreased during training with increasing age. Traumatic injuries were more frequent in matches and were linked with increased age. Overuse injuries were two times higher during training than matches in the U-17 team. The majority of traumatic match injuries (78.3%), proposed the idea that the age of a player has an impact on injury occurrence in connection to training or game exposure. Higher intensity of play and increased physical demand may lead to an escalation in match injuries and a propensity towards more stressful mechanisms with age. A vigilant approach towards training intensity, tactical and technical abilities, together with the progress of coordination, muscle strength and endurance, is of utmost importance in order to reduce prevalence of overuse injury during training in younger players (Ergün et al. 2013)injury incidence increased during matches and decreased during training with increasing age. Traumatic injuries were more frequent in matches and were linked with increased age. Overuse injuries were two times higher during training than matches in the U-17 team. The majority of traumatic match injuries (78.3%).

Anthropometric characteristics have also been recommended as a possible predictor to football injuries (Nilstad 2014). Greater joint laxity (excessive joint mobility in several joints) has been identified as another intrinsic risk factor that leads to an increased chance of injury in female players (Söderman et al. 2001). Leg dominance is another factor which seems to be contributing to injury. Whilst men seem to have a great chance of injury on the dominant leg, women are more likely to injure the supporting leg (Faude et al. 2006). Previous injuries are likely to be reoccurring when the players either do not follow a proper, complete rehabilitation programme or when they return to play prematurely (Söderman et al. 2001).When it comes to comparing men and women: size, composition and physiology of the body are basically alike in boys and girls before puberty. After puberty female bodies tend to have lower bone mass, a wider and shallower pelvis and a larger surface area to mass ratio in comparison to male bodies (Sanborn and Jankowski 1994). Women's wider pelvis, which consequently changes the alignment of the knee and ankle (Shmerling 2015) is an intrinsic physiological factor which contributes to the difference in the injury rate between the two genders. Because of these physical characteristics women are more prone to suffer from the most common types of injuries related to sports than men (Shmerling 2015).

**Extrinsic risk factors**

Extrinsic factors are numerous, but the two main factors are the exposed time (volume and frequency of training and play), and the surface on which players train and play (Nilstad 2014). Both factors may contribute to the risk of overuse injury, with time for rest and recovery being fundamental (Söderman et al. 2001). In addition, when comparing
artificial and natural surfaces, Steffen et al. (2007) claim that playing on artificial grass poses double the risk of injury than natural grass. Furthermore, the environment can also significantly affect the players’ performance and resultant injuries. Environmental conditions such as temperature, humidity and rainfall can compromise ground conditions, succeeding in affecting the players themselves (Gabbett et al. 2007).

Modifiable and non-modifiable risk factors

While modifiable risk factors are those factors that can be altered by, for instance, injury prevention strategies; non-modifiable factors are factors that cannot be changed such as age and gender, but which are still important contributors to injury (Emery, Meeuwisse et al. 2005; Nilstad 2014).

Recurring injuries

Injuries can be new, local and recurrent. These three categories are suggested for use in coding of injuries (Finch and Cook 2014; Figure 2.2) recurrent, exacerbation or new.

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>New injury</td>
<td>Different location</td>
</tr>
<tr>
<td>Local injury</td>
<td>Same location but different type</td>
</tr>
<tr>
<td>Recurrent injury</td>
<td>Same location and same type</td>
</tr>
</tbody>
</table>

Figure 2.2 (Source: Finch and Cook 2014) recurrent, exacerbation or new

A recurrent injury is an injury occurring at the same site and being of the same type as the index injury (Finch and Cook 2014; Fuller et al. 2006) recurrent, exacerbation or new. These injuries happen subsequently to the player returning to full participation following the injury. Injuries in sports are frequently recurrent and some athletes experience various injuries during their sports career. Subsequent injuries have been recognised to be strongly subjective to previous injuries (Ullah et al. 2014) with subsequent injuries influenced by previous occurrences and hence correlation between events needs to be taken into account when analysing such data. Objective This paper compares five different survival models (Cox proportional hazards (CoxPH). Causes for these recurring injuries include similar injury mechanisms and risk factors in particular intrinsic ones or insufficient tissue healing from the previous injury (Ullah et al. 2014) with subsequent injuries influenced by previous occurrences and hence correlation between events needs to be taken into account when analysing such data. Objective This paper compares five different survival models (Cox proportional hazards (CoxPH). Hägglund, Waldén and Ekstrand (2006), confirmed recurrent injury as one of the most important risk factors in football players. Injury rate was found to be 2.6 times higher in players who had a previous injury in comparison to players who had no previous record of injuries (Kucera et al. 2005). Possible contributing factors were thought to be poor rehabilitation or even early return to play after the index injury (Kucera et al. 2005). It is important to point out however, that while rehabilitation and appropriate time to return to play are important factors, previous injuries still increase the risk of recurrent injury irrespective of the rehabilitation programme followed and the time allocated to healing. This could possibly be due to the fact that residual deficits in the affected joint or muscle of the player, render the area more liable to other injuries (Kucera et al. 2005).
Conclusion to the literature

While literature has comprehensively studied the prevalence and risk factors of injuries in football players, it has done less so in view of women football players. Considering the central role of gender as a factor that induces injury (Shmerling 2015), and considering the lack of literature in the field of football injuries among women, more specifically in the Maltese context, this study has focused on obtaining an overview of injuries in Senior Women Football Players in Malta.

Methods

With its aim of obtaining an overview of injuries in senior women’s football in Malta, this paper shall present a clear picture of the actual number of injuries, which are the most common, what causes them, and the most common playing position to suffer injuries. This study looks at the correlation between the number of injuries and specific characteristics (age and mass) of footballers. This section presents an explanation of the research design and methodology used to obtain this objective. It will also present an overview of the rationale which led to such choices, and the justification of the theoretical framework, together with a thorough explanation of the research question.

The entire population of 120 senior women football players in Malta was invited to participate in this study. All seven active women’s football clubs (in 2019/2020) accepted to participate but not all players of each respective club were available to contribute to this study. Polit and Beck (2013) referred to this as the accessible population. Once ethical clearance was obtained from the Ethics Board within the Malta College of Arts Science and Technology (MCAST), and once permission was granted by the Malta Football Association, all the seven football clubs participating in the BOV women’s league 2018/2019 were invited to participate. Coaches of each club were contacted via e-mail and were provided with the relevant details. This approach was chosen to enable the coach to talk to the participants beforehand and hence give them time to reflect and consequently facilitate anyone’s wish to decline. To retain anonymity and confidentiality, the participating clubs will be referred to as clubs: A, B, C, D, E, F and G.

Since the targeted group was small and was set apart by a well-defined characteristic, total population sampling was used (Tongco 2007) with the intention to allow generalisation of findings. As confirmed by the director of Maltese women’s football, the total population of women participating in the league during season 2018/2019 was that of 120 players. There were 9 players who were under 16, and thus were omitted from participating in this study and the total population. That led to 111 potential participants. By the time all the clubs were contacted, Club C had dropped out of the league during the reporting season. With the help of their coach, questionnaires were completed by some of the players whose replies were still relevant since focus was retrospectively based on the 2018/2019 season. Out of the 111 available players, another 11 players did not respond, thus the sample was made up of 100 players (83% of the total population) which resulted in a confidence level of 99% with an interval of 4.08. With an average of 14.28 players per club participating in this study, the 100 participating women football players came from: (Figure 3.1) club A (15), club B (13), club C (10), club D (20), club E (16), club F (11), club G (15). These players had an average age of 22.5, with a standard deviation of 5.89 and with the median being 21.5 years of age. The age of the participants varied between 16 and 45 (Figure 3.2). The average and median show the young age of the population in question, which in the case of women football players is below the peak age of 25 years (Dendir 2016).
An online questionnaire was sent, via Google Forms, to every player participating in the women's football league during the 2019/2020 season. A structured questionnaire was opted for, with formulated questions addressing variables for the researchers of this study to investigate. Some replies to the questions in the questionnaire, was allowed the option of other as it was deemed to be the best way to answer certain questions. Questions were based on retrieved existing literature in this field of study. As the questionnaire was self-designed, its establishment as a data collection tool had yet to be validated. Once sampling was taken care of, to further diminish possible threats to validity, which may also include the instrument used to collect data (Bowling 2009), the questionnaire was submitted for validity testing, through content validity. Two qualified physiotherapists and a sports doctor having more than five years' experience in the field, autonomously and anonymously assessed this data gathering tool, and evaluated each statement in terms of relevance to the research aim on a 4-point scale (1 being not relevant and 4 being highly relevant; Talbot 1995). All three professionals were contacted via e-mail. After they confirmed their will to participate, they were given a seven-day timeframe to forward their reply. The final scores obtained by the three individual validation processes were 0.84, 1, and 0.95. The mean score was 0.95, and therefore the questionnaire was considered to be valid (Polit and Beck 2016). Their fundamental feedback was closely analysed, and the questionnaire was amended accordingly.

After authorisation to collect data was obtained from all related clubs, all local women's football clubs were presented with an information e-mail which clearly explained the study and the process of data collection. The letter clearly specified that participation was voluntary. It also emphasised that it was possible for participants to retract from the study at any given time (Polit and Beck 2010). Clubs were reassured that information would be solely used for research purposes. No reimbursement was proposed but disclosure of results was offered, as this would serve as a means of service improvement. Signed consent forms were acquired in order to safeguard the ethical principle of informed consent (Bowling 2009). Exclusion of clubs and players' names in the questionnaire was opted for, as a means of anonymity, while discardment of all the questionnaires after completion of research safeguarded confidentiality. Being a quantitative study, statistical tests (inferential statistics) were opted for (Liamputtong 2019) in order to identify relationships between variables. The Pearson correlation test was utilised to measure the existence (by means of a p-value) and strength (given by the coefficient r between -1 and +1) of a linear relationship between two variables (Gilchrist and Samuels 2015).

One limitation of this study was that data was collected retrospectively, with results based on data of the previous football season. Therefore, players might have forgotten...
to mention certain injuries that were not so significant to them. Another limitation was that one of the clubs (Club H), was unavailable since they had been dissolved by the time of data collection. This limitation was however partially resolved as those players who used to play for Club H during the 2018/2019 season, and were still playing with other clubs in 2019/2020, could be recruited for this study. In addition, Club C also stopped participating in the league while the researcher was collecting data. Some of the players of this club were contacted with the help of common contacts. However, this outreach was not possible to do with all, therefore the researchers failed to recruit all the players of Club C. This chapter demonstrated that significant attention was paid to the strengths of the study and that all possible efforts were made to compensate for limitations, for the sake of achieving a precise view of the number and nature of injuries in women’s football in Malta.

Results and Discussion

Injuries in Malta women’s football in the 2018/2019 season

During the 2018/2019 season, 63% (63 players) of Malta women football players played in the seniors’ league, were injured, while the remaining 37% were not injured. From these 63 players, 44 suffered only 1 injury; 15 sustained 2 injuries; while the remaining 4 sustained 3 injuries (Figure 4.1). When compared to literature (Giza et al. 2005), this puts Malta football players at a higher risk of injury. From a sample of 202 players in Giza’s study, 54.5% were injured. This means that Malta players have an 8.6% higher chance of getting injured. That accounts for 173 injuries among 202 players for Giza et. al. (2005), and 86 injuries in 100 players for this local study.

![Figure 4.1: Players injured in the 2018/2019 season](image)

Playing position

Defenders had the highest amount of injuries (22) when compared to those playing as goalkeepers (8), midfielders and/or defenders (3), midfielders (15), midfielders and/or strikers (8) and strikers (8). When compared to the total population per position, this puts strikers at the top of the scoring board with 88.89% of the strikers incurring an injury. This higher injury prevalence when playing in an attacking position, is sustained by the fact that 66.67% of those playing as midfielders and/or strikers, got injured. These two positions were followed by goalkeepers who had a rate of 63.64%, defenders (61.11%), midfielders and/or defenders (60%), and midfielders (50%) (Figure 4.2).
Position | Participants | Injured | Percentage
--- | --- | --- | ---
Goalkeepers | 11 | 8 | 63.64%
Defenders | 36 | 22 | 61.11%
Midfielders and/or defenders | 5 | 3 | 60.00%
Midfielders | 27 | 15 | 55.56%
Midfielders and/or strikers | 12 | 8 | 66.67%
Strikers | 9 | 8 | 88.89%

| 100 | 64 |

**Figure 4.2: Rate of injuries per position**

This high injury prevalence sustained by strikers is also supported by Kumar et al. (2008), and Hunt and Fulford (1990) who have strikers placing second, right after the midfielders, as those with the highest risk of injury. Fuller et al. (2006), have also ranked strikers as second in the list, however, following defenders as those running the highest risk of injuries. This high prevalence of injuries incurred by strikers may be occurring since play may get aggressive when strikers are involved in action (Hägglund 2007). While our study shows agreement with international studies when it comes to strikers’ high prevalence to injury, it differs boldly when it comes to midfielders. This study, in fact argues that there may be many reasons as to why in Malta senior women’s football midfielders were those who recorded less injuries, including the style of play, the intensity and the involvement of midfielders in the game played in Malta.

**Body parts**

The wide variety of injured body parts are shown in Figure 4.3. Results show that the body part injured most often was the knee, accounting for 35.3% of the injuries reported, followed by the ankle (34.1%), groin (7%), thigh and foot (4.7%), the calf, elbow and wrist (2.6%) and chest, glutes, lower leg, neck, upper back and ribs (1%).

**Figure 4.3: The body parts injured vs number of injuries**
This high prevalence of knee and ankle injuries is sustained by literature (Henakaarachchi et al. 2017), which also claims that injuries in the ankles are very common and are irrespective of the players’ gender (Junge and Dvorak 2007; Waldén, Hägglund and Ekstrand 2009). On the other hand, literature also sustains that knee injuries are the most common in women players (Hagglund and Waldén 2012). Indeed, such injuries may be attributed to female physiological traits specifically hormones, anatomy, neuromuscular activation, femoral notch and core stability (Lewis 2000). Additionally, the 7% groin injuries reported in this study may be attributed to the large range of motion in the hip area brought about by changing direction rapidly and by the quick starts and stops which are characteristic of this sport (Henakeaarachchi et al. 2017).

**Injury incidence**

From a total of 86 injuries, the majority (53.5%; n = 46) occurred during games whilst the remaining 46.5% (n = 40) happened during training sessions. From the players who incurred one injury during the entire season (n = 63), 53.97% (n = 34) were injured during a match, while the remaining 46.03% (n = 29) were injured during training sessions. The same applied for players suffering from two injuries (n = 19) of whom the majority (57.89%; n = 11) incurred injuries during the match, as opposed to the 42.11% (n = 8) who reported injuries during training sessions. However, when taking into consideration players suffering from three injuries, only one participant was injured during a match while the other three were injured during training sessions. Figure 4.4 shows the error margin which is the maximum anticipated difference between the total population parameter and a sample approximation of that parameter was that of 5.59.

The match to training injuries ratio varies across literature, with studies claiming that women football players are three times more likely to get injured during football matches (DataIys Center for Sports Injury Research and Prevention and National Collegiate Athletic Association 2009) and others reporting the highest amount of injuries occurring during training sessions (57.40%; Kumar et al. 2008). These differences could be known, amongst other reasons, to the training and matches’ level of intensity (Ward et al. 2018).

![Figure 4.4: Incidence of Injury in training and in games.](image-url)
Types of injuries

Ligament sprain resulted to be the most common injury (60.47%; n = 52) of all injuries. That was followed by muscle strains (20.93%; n = 18), fractures (5.81%; n = 5), and contusions (bruises) and dislocations (2.33%; n = 2). The remaining variety of injuries including shin splints, burns, chronic injury inflammation, lateral meniscus tears, patellar tendinopathy, posterior tibial tendonitis and golfers’ elbow all scored the same percentage of 1.16% (n = 1), meaning that these were all just as frequent. Football calls for running on an uneven surface when the body is put in an unnatural twisting motion. This is significantly demanding on the footballers’ physique especially the ankle and knee joints. It becomes even more challenging when the foot is clumsily positioned due to the same uneven surface or twisting movements. This unnatural, demanding movement might therefore be the main contributing factor to the considerable number of ankle injuries sustained by local football players. When a ligament is forced to move out of its original position it is very common for it to stretch or even tear (Henakaarachchi et al. 2017). This justifies the high occurrence of ligament sprains. Moreover, muscle strains were also found to be rather common (20.93%; n = 18). A strain normally occurs in a muscle on which an extreme pulling force is applied with a result of overstretching (Järvinen et al. 2000) contusions or strains-are by far the most common injuries in sports. After first aid following the RICE principle (Rest, Ice, Compression and Elevation. Hence, this explains why in sports like football where sprinting, kicking and jumping are frequently necessary, strain injuries are quite commonly seen (Järvinen et al. 2000) contusions or strains-are by far the most common injuries in sports. After first aid following the RICE principle (Rest, Ice, Compression and Elevation. Due to the intense physical contact and excessive demand on the players during the actual football game, contusions (bruises) resulted as the third most common type of injury in Maltese women football players.

Mechanism of injury

Contact with the ground while landing ranked the most common mechanism of injury at 45.35% (n = 39). Collision with another player (31.40%; n = 27), contact with the ball (10.47%; n = 9), overextension of specific muscles while playing (6.89%; n = 6) and a sudden change of movement (4.65%; n = 4) represented the remaining mechanisms of injury (Figure 4.5).

![Figure 4.5: Mechanism of injury](image)
Inappropriate landing increases the risk of injury as lower extremity strength, balance, range of motion and motor learning technique of landing all play a crucial role (Dai et al. 2016). Rahnama et al. (2002), suggested that some actions of play such as tackling, getting tackled and receiving a charge are connected with a higher chance of injury. This is similar to the more recent findings of Sentsomedi and Puckree (2016) (36.5%, who also identified collisions, especially those with other players, to be the most common injury mechanisms.

Correlation between age, mass and number of injuries

Focusing on the importance of exploring the main factors that influenced injuries in local senior women football players during the 2018/2019 season, and grounded in the concept of modifiable and non-modifiable factors (Emery, Cassidy et al. 2005; Nilstad 2014) we randomly selected 10 of 15 high schools in Calgary to participate in the fall of 2001. We then recruited students from physical education classes and randomly assigned them, by school, to either the intervention (n = 66) or the control group. This study examines (i) the correlation between footballers’ age and number of injuries, and (ii) the correlation between footballers’ mass and number of injuries. Following a Pearson correlation test, a negative coefficient with a weak correlation was obtained for both age (r = -0.098) and mass (r = -0.043). That shows that these results show that the number of injuries decrease with higher age and mass.

Although one might expect to find that the younger the players are, the lower the number of injuries (Arnason et al. 2004), these findings show an absolute contrast. While this may sound strange, one may argue that with a very young average age, women football players in Malta are not yet being prepared to endure the tough necessities of the game. This may indicate the necessity for more hypertrophy and strength training to prepare the younger players for the game. We argue that it could be the case that this modifiable factor, which is reflected in muscle mass, may indirectly influence the correlation between the number of injuries and footballers’ age. Hence if that would be the case, and all players are equally strong, with equal muscle mass, then it could be that a similar test would be able to prove that when muscle mass is similar, age will positively correlate to the number of injuries. This is however a field that could not be tested with the data acquired and with the existing small population. It could however, be an interesting suggested study for the future.

Surface and footwear

Figure 4.6 illustrates the different types of surfaces on which participating players were playing when they suffered an injury. A significant percentage, 89.5% (n = 77), of the participants were playing on synthetic/artificial Grass; and 7% (n = 6) of injuries occurred on natural grass while the remaining 3.5% (n = 3) happened while playing or training on hard surfaces. The vast majority of matches and training sessions referred to in this research were all held on artificial grass, therefore this may place a huge bias on the results obtained.
Bianco et al. (2016), similarly stated that playing on artificial turf led to specific body parts being injured namely the thigh and groin, with the most common type of injury being muscle strain. These findings do not coincide with the local ones. However, the fact that the ankle was the most commonly injured body part with sprains being the most common types of injuries, strongly relates to Hägglund et al.’s (2016) findings, in which ankle sprains were indeed higher when playing on artificial grass. The authors in fact attributed this higher frequency to the stronger shoes’ surface grip on artificial grass.

Figure 4.7 illustrates the different type of footwear that was used by the participating players at the time of injury. Artificial grass shoes (having shorter and circular studs combined with bladed studs of firm ground) were the most commonly worn during an injury (74.4%; n = 64). The injuries occurring to players wearing the firm ground/moulded cleat (having non removable rubber studs that are bladed or conical in shape) (15.1%; n = 13) and artificial turf shoes (made up of very short studs that are tightly positioned next to each other), (7%; n = 6) were considerably less. Running shoes and soft ground shoes (having longer studs for wet surfaces and a metal tip and/or detachable studs) accounted to the remaining 2.3% (n = 2) and 1.15% (n = 1) respectively.

Figure 4.6: Type of surface upon which the injury took place

Figure 4.7: Type of footwear used
As Figure 4.6 previously demonstrated, most of the games and training sessions the participants have available occur on artificial grass. Hence, one may conclude that the most used shoes were artificial grass shoes. This could imply that the results are in a way generalised since in Malta the population is very small and all clubs make use of artificial grounds. Additionally, one has to bear in mind that the type of footwear opted for goes hand in hand with the type of surface utilised.

**Reoccurring injuries**

Figure 4.8 illustrates the discrepancy between the total number of reoccurring injuries and those of new onset. For the purpose of this research, reoccurring injuries were taken to be those sustained on the same side and of the same type. Reoccurring injuries amounted to 22.09% (n = 19) while 77.91% (n = 67) of the injuries were considered to be new. This resonates with Hägglund et al. (2016), who reported a reoccurrence rate of 7 to 22% in professional men footballers, together with a rate of 14 to 33% at an amateur level. This suggestion of higher injury recurrence rates with lower playing levels (amateur) leads to an interesting insight and discussion.

These re-occurred injuries could arise from various factors, one of which being injury severity and subsequently, allocating insufficient time for rehabilitation. Another factor might be the fact that once there is an injury, an individual will remain prone to that particular injury for the rest of their life, as strength, proprioception and kinematics may lead to overall changes in the function and motor control of that particular area (Fuller et al. 2006). Additionally, Hägglund et al. (2016) claimed that the level of play was found to affect the reoccurrence rate of injury. In fact, at least one third of all injuries reported in amateur players were recurring ones (Hägglund et al. 2016). Locally, women's football is only played at an amateur level. This might therefore account to the rather high percentage of re-injury. Professional squads invest more in their players and there is therefore an association with superior access to physiotherapy and qualified medical personnel. In professional leagues, teams may be made up of more players than those found in amateur leagues. That may also lead to a higher chance of having irreplaceable players in amateur squads, who (the players) are not given the necessary recovery period (Hägglund et al. 2016). Other factors including pitch conditions, climate, seasonal disposition and the intensity of play can differ between cohorts and hence may affect the risk of both recurrent and new injuries.

![Figure 4.8: New injury vs reoccurring injury](image-url)
Conclusion of the Literature

The main contribution of this study is that of providing one of the first snapshots of injury prevalence in sports in Malta, more specifically women’s senior football. A very important finding emerging from this study is the fact that 63% of women football players were injured in the 2018/2019 season. Having the majority of the total population affected by an injury is rather worrying, especially when one considers that some of the players sustained the second and, in some cases, even the third injury. In concordance with other studies, the body parts that were most commonly injured among women football players in Malta, were the ankle and knee. Another outcome which merits to be pondered on was the high percentage (60.47%) of ligament sprains sustained by these players. Although it was weak, the negative correlation between age and mass, and rate of injury is also another point that needs attention, and which perhaps can lead to a plausible solution: that of increasing hypertrophy and strength through an improved strength and conditioning protocol in clubs, with the aim to reduce the overall rate of injuries in women’s football in Malta.

In Malta, participation of women in football is on the increase, across all ages, starting from a young age to senior leagues (Times of Malta 2016). Recently, some women players have also had the opportunity to relocate abroad in order to start their career as professional football players (Mata Football Association 2020). While this is extremely encouraging there is definitely room for further improvement. This is evident when it comes to injuries occurring both during games and training sessions. Injuries in football can considerably impact the clubs, sometimes being the sole factor, which determines a win or a loss. In addition, injuries incur a lot of expenses both to the players themselves as well as to the clubs.

When compared to literature, the percentage of players getting injured in one season, locally, is rather high (63%) when compared to other findings (Giza et al. 2005). A too high or a too low load/frequency or intensity compared to the footballers’ level of play have been highlighted in literature (Arnason et al. 2004) as being significant in the origin of injuries. Physiology of the female body is another contributing factor and hence specific strength and conditioning exercises should be included in the training regimes focused particularly on lower extremities. This is supported by the weight-injuries’ negative correlation discussed earlier on.

Limitations and future research

The gap in literature when it comes to research about women’s football at amateur level is an extrinsic limitation that made it hard to compare to other relevant findings. However, that makes this study an important one in the field, both in Malta and internationally. While this study can be used as the benchmark of injuries in women’s football for both clubs and associations, it would be ideal to hold this kind of survey during every season, and ideally, differentiating from this study, by designing a survey which is not based on retrospective data collection. The fact that there was no other local data was also a limitation to this study. Hence, further similar research is recommended in order to obtain a wider picture of injuries in women’s football in Malta.

When looking deeper at the correlation between weight and injury rate, one needs to first identify the BMI of the players to identify if they range on the overweight or the underweight side. That would inform upcoming research and hopefully intervention
programmes better. Furthermore, as suggested earlier, one may need to start looking at injuries and how that is related to playing positions by also looking deeply at the style of play. It may also be interesting for future research to look at the way the game is played in different countries, how that style of play influences the role of players in their respective positions, and how that may relate to injuries.

References


