Module 3. Sport-Specific Pathologies

3.1 Field hockey and roller hockey

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Field hockey

1.1. Introduction

Field hockey is one of the most practiced sports in the world (it is the second most practiced team sports after football), with more than 130 countries that are members of the International Hockey Federation and with one of the highest amount of federation licenses (International Hockey Federation, 2018).

As in many other sports, there are amateur, semi-professional and professional participants.

1.2. Characteristics

Field hockey is a sport practiced by 22 players (10 players and 1 goalkeeper in each team) on a synthetic grass field whose size is 92 meters in length and 55 meters in width. The game lasts 70 minutes, divided in 2 or 4 periods according to the competition. Changes are limited.

There is a type of hockey called floor hockey, which is generally played indoors, on a smaller-dimension field where 4 players play against 4, plus the goalkeepers.

Players can only touch the ball with the stick, except the goalkeeper who can do it with any part of his/her body.

1.3. Biomechanics

Players' posture, not only when conducting the ball (with trunk, hip and knee flexion) but also in the defensive position (with trunk, hip and knee flexion and with the stick right above the surface (Figure 1), involves an important overload in the lumbar and pelvic region.

Figure 1: Offensive position (left) and defensive position (right) in field hockey

Source: own creation

It is an asymmetric sport: when holding the stick, the controlling hand is more distal and the non-controlling hand is in the proximal position.

The penalty corner shooter is the one who is more at risk of suffering from injuries in the adductor and pubic region, due to the position taken when carrying the ball (Figure 2).

Figure 2: Typical posture of a penalty corner shooter in field hockey

Source: Websdale, 2010, https://www.flickr.com/photos/rosswebsdale/4369518374

1.4. Material used and game surfaces

One of the aspects that influence the most in hockey injuries is the material used. Most injuries in this sport are caused by hits against the opponent or with game materials, that is why the material used for protection is important.

Using synthetic grass for game surfaces worldwide has also brought about injuries more frequently associated to that surface's hardness.

Protection material

- Shoes: hockey boots with cleats for facilitating grip.
- Shin guards: widely worn by athletes.
- Testicle protector: used by men, not widely. It is always used in the penalty corner.
- Mouth guard: protection for teeth, lips and jaw. It is widely used and it is compulsory in many countries (Nutt, Shannon, Wright and Feinstein, 1989).
- Hockey goggles: they have been introduced in the USA for all players in the women's hockey institute. This element's wide use has shown a decrease in ocular and orbicular injuries, as well as face and cranial injuries (Kriz, Zurakowski, Almquist, Reynolds, Ruggeri and Collins, 2015).
- Protection helmet: the use of a protection helmet is allowed (not compulsory), mainly in minor leagues.

- Protection gloves: hands are highly exposed to contusions due to blows of the ball or other sticks and it is important to protect them.
- Goalkeeper´s protection (Figure 3): the goalkeeper wears a helmet, a chest protector, gloves and guards.
- Protection for penalty corner (Figure 3): it is one of the most important plays in field hockey and one of the riskiest situations. Defensive players run in the shooter´s direction for blocking him/her and he/she throws the ball towards the goal at a speed that could reach 130 km/h in men and 100 km/h in women. Because of the multiple injuries from direct contusion that were caused by these types of plays, it was established that defensive players should wear protection masks and gloves (Figure 3). Men also wear testicle protection.

Figure 3: Goalkeeper´s protection and protection masks worn in the penalty corner shooting in field hockey

Source: own creation

1.5. Main injuries

In a study carried out in the American University League during 5 seasons, it was determined that muscle injuries and contusions (mainly due to ball or stick) were the most frequent injuries; besides, contusions were more frequent in matches and muscle injuries were more frequent in training sessions (Pierpoint, 2017). The injury index is not different to other team sports (Barboza, Joseph, Nauta, van Mechelen and Verhagen, 2018).

- Ligament injuries: the ankle sprain is the most frequent injury in the world of sports. The field hockey cannot escape this tendency: ankle injuries are one of the most frequent ones. Knee ligaments injuries are also significant. On the other hand, the anterior cruciate ligament injury and the medial collateral ligament injury are the most frequent.
- Contusions: wearing protection material has decreased not only the number, but also the severity of contusion injuries. One of main causal mechanisms is the elevated balls. The most affected zones are the hands, the trunk and the head.
- Muscle injuries: the thigh area is frequently affected, mainly at the biceps femoris level. Injuries in the adductor muscles are more frequent in goalkeepers and penalty corner shooters. Muscle injuries occur, in general, in the matches' final moments and they are more frequent when individuals are older.

Because of the posture adopted by the hockey player, ischiotibial muscles are especially vulnerable, that is why it is important to follow an injury prevention indication specific to the area.

Injuries caused by overuse (Orooj, Nuhmani and Muaidi, 2016):

- Lower back pain: the lower back pain is common in field hockey players, even in early ages. This is due to posture when conducting the ball and to trunk rotation and flexion during passes/shoots. It affects more frequently to penalty corner shooters. It is important to diagnose players with short ischiotibial muscles, since they are more prone to suffering from lower back pain.
- Groin pain: it typically affects the penalty corner shooters, due to the posture they adopt during shooting (Ng, Sherry, Loh, Sjurseth et al., 2016).
- Shin splints: pain in the pretibial region is common in hockey players. This is due to the type of exercise and to the artificial grass hardness. A wrong plantar support (flat feet mainly) can also be the cause of these symptoms.
- Plantar fasciitis: this pathology has increased since the artificial grass was introduced; it is a surface that is harder than the natural grass. It is important to carry out a good podiatric study on players for avoiding predisposing factors and for guaranteeing they wear the adequate shoes.
- Epicondilytis/Epitrocleitis: elbow injuries are frequently caused by the way players hold the stick and they are more frequent when players change material (lighter/heavier stick, change in holding, etc.).

2. Roller/ice hockey

There are two types of roller hockey.

2.1. Traditional roller hockey

2.1.1. Introduction

It is a sport with a great tradition in Europe. They started playing it in England at the beginning of the 20th century. Currently, it is officially played in 35 countries. Spain is the most prize-winning national team with 17 men world championships and 10 women world championships. Other countries with a great roller hockey tradition are Portugal, Argentina, Italy and France.

2.1.2. Characteristics

It is a sport practiced by 10 players (4 players and 1 goalkeeper in each team) on a parquet, cement or plastic pitch, whose measures are 40 x 20 meters (36 x 18 m minimum, 44 x 22 m maximum). The pitch perimeter is surrounded by a 20 cm wood board and a fence of at least 1 meter high. Goals are fixed to the floor and they are movable in case of collision of a player or the goalkeeper. Changes are unlimited.

Players move around with skates with parallel wheels and with breaks in all cases. The stick´s length, diameter and weight are regulated by the International Federation. Most of them are made of wood.

The game has two parts of 20 or 25 minutes, according to competition.

Thanks to the use of indoor electronic tracking system technology (Wimu Realtrack System), we have been able to show that the average for a roller hockey pitch player is of 5 to 7 km each game and that they can reach peak speeds of 25 km/h, according to FCB unpublished data.

2.1.3. Biomechanics

Roller hockey is a sport that is played at high speed, that is why it needs a great coordination.

We should take into account that the rollers´ wheels are used for accelerating and braking, and the brake is also used for braking and accelerating.

Players´ posture when conducting the ball is usually with trunk flexion. Changes of direction are caused by changes in the body weight through pelvic, knee and ankle movements.

Figure 4: Offensive position (right) and defensive position (left) in roller hockey

Source: own creation

The defensive position usually requires lateral displacements, so the adductor muscles are used. Besides, the stick is usually held with only one hand for covering more space.

Goalkeepers are generally on squat position and they can displace laterally and they can get to the ground for blocking a shoot. They constantly make sudden movements with the pelvic girdle.

Shoots are performed with great power and players need to make sudden and quick rotations in the abdominal and lumbar muscles.

2.1.4. Protection material

Player: shin guards, knee guards, testicle protection, mouth guards, and gloves. The helmet is, so far, optional, mainly on minor leagues. It has been proposed for next season that wearing a helmet is compulsory for players in the pitch, in all competitions (Figure 5).

Figure 5: Protection used in roller hockey

Source: own creation

Goalkeeper: helmet, chest protector, laryngeal protection, elbow pad, guard, testicle protection, gloves (Figure 6).

Figure 6: Goalkeeper protection and basic position in ice hockey

Source: davidgsteadman, 2009, https://commons.wikimedia.org/wiki/File:James_Reimer.jpg

2.2. Ice hockey

2.2.1. Introduction

It was originated in Canada. It is currently very popular in many countries around the world. The International Ice Hockey Federation has more than 76 member countries.

The in-line hockey, a variation of ice hockey, was created with the idea of practicing in-line hockey during summer period or in zones where ice rinks are not possible due to its high cost. It is practiced with in-line skates, on ice or on plastic (it can also be played on parquet, asphalt or cement). The rules, the court size and the team of players and goalkeepers are practically the same as in ice hockey.

2.2.2. Characteristics

It is a sport practiced by 12 players (5 players and 1 goalkeeper in each team) on an ice rink, whose size is 60 x 26 meters. Ice should be below 10 °C. It is one of the quickest team sports, since the friction of the skates and the puck against the ice is minimum.

The court perimeter is surrounded by an opaque boundary of, at least, one meter in height and it has a transparent protection above it, which allows the spectators´ view and, at the same time, it protects them in case the puck is flipped out of the rink.

Goals are not fixed to the floor and they are movable in case of collision of a player or the goalkeeper. Changes are unlimited.

Players move around by skates with blades. The stick´s length, diameter and weight are regulated by the International Federation. Most of them are made of wood.

The game has two parts of 20 or 25 minutes, according to competition.

Although fights are prohibited in international competitions, in the American league (NHL) fights between two opponents is still common, as long as they are not wearing protection equipment.

2.2.3. Biomechanics

Posture in ice hockey is similar to the one adopted in traditional roller hockey. The main difference is on speed, which is even higher when sliding on ice. Braking is much more abrupt, since it has to be made always by skidding with the blades.

Shoot is not so based on a blow as in traditional hockey, but it is more related to dragging the puck, which gives it great speed on ice.

The goalkeeper´s posture is usually with trunk flexion and knee flexion, leaving a gap between the legs which is protected with the stick´s end. A typical gesture in ice hockey goaltenders is to fall on their knees for closing the gap between the legs (butterfly style). That movement greatly involves the knee´s internal structures (Figure 6).

Body check (Figure 7) is one of the injury riskiest factors and it is allowed in men's senior ice hockey, but not in women´s. In men´s minor leagues, rules vary according to the country and the competition.

Figure 7: Body check against the lateral rink protections Game situation with a great injury risk

Source: U. S. Air Force, 2007, https://www.af.mil/News/Article-Display/Article/127477/hockey-gophers-ground-falcons-season-in-3rd-period-rally/

2.2.4. Protection material

Helmet, chest protector/shoulder pads, knee guards, shin guards, testicle protection in males, mouth guards, guards in goaltenders.

Materials should favor thermoregulation in athletes, given the low temperatures in the rink.

2.3. Lesiones

Pons M. Ferrer (1991); Varlotta, Lager, Nicholas, Browne y Schilfstein (2000); Mosenthal, Kim, Holzshu, Hanypsiak and Athiviraham (2017):

- Contusions: they are, by far, the most frequent injuries in roller hockey. The ball, the stick, the goal or the fences are the causes of these contusions. They are more serious than in other sports, due to the great speed at which this sport is played.
- In the case of ice hockey, although most cranial contusions that occur during the sport practice are mild, it has been shown that there is a risk of encephalopathy in the long term (McCrory, Johnston, Mohtadi y Meeuwisse, 2001).

- Muscle injuries: the most frequent injuries occur in the thigh: adductor, ischiotibial and quadriceps muscles are the most affected. The medium adductor is the most frequently injured muscle.
- Ligament injuries: the ankle sprain is the most common ligament injury, although the ankle is partially protected by the skate´s boot. In our FCB casuistry, it is not as frequent as muscle or tendon injuries. Ankle sprains are anyway explained by the multiple movements that the ankle articulation makes, not only in spins, but also in brakes.

The medial collateral injury is the most frequent in the knee, due to its position when pushing the skate outward for sliding. The knee cruciate ligament injury is less frequent than in other sports, since feet are not fixed on the ground, at the contusion moment by the skate inertia.

The acromioclavicular sprain is common, due to falls on the shoulder.

- Fractures: the superior limbs fractures (clavicle, radius distal end, scaphoids, among others) are frequently associated to falls at high speed. Rib fractures are also common after contusions against the fence or, in goaltenders, after a contusion against players or the ball.

Injuries caused by overuse:

- Lower back pain: it is caused by the trunk anterior flexion during the conduction and the hyperextension applied when skating backwards.
- Groin pain: it is caused by the adductor muscle overuse; decompensation and groin pain symptoms are frequent in roller hockey players.
- Rotator cuff syndrome, epicondilytis, epitrocleitis.
- Anterior tibial tendinitis.
- Trochanteritis.
- Femoro-acetabular impingement.

Pathology typical in traditional roller hockey goaltenders (Pons Ferrer, 1991):

- Overload on ischiotibial muscles: the squat position overloads the ischiotibial muscle a lot, that is why players usually suffer from muscle overloads and tearing.
- Meniscopathy: the same squat position, together with sudden position changes, causes a significant overload on the knee medial and lateral compartments, frequently causing meniscus tears.

Ice hockey goaltender´s pathology (Flik, 2005):

Hockey goaltenders get injured more frequently than other players in different game positions.

- Internal meniscopathy: the butterfly technical gesture generates great overload in the knee internal compartment. The most common injury is meniscopathy and it can also cause injuries in the internal lateral ligament and the anterior cruciate ligament.
- Hip pathology: Femoro-acetabular impingement, labrum's injury, chondromalacia.
- Lower back pain and groin pain.

3. Prevention

- Adequate protection wearing.
- Early diagnosis: previous assessment about all athletes: short ischiotibials, dysmetrias on inferior limbs, podiatric assessment.
- Adequate physical preparation: the characteristics in hockey force athletes to have a great aerobic capacity to improve endurance and provide players with an anaerobic power that is enough for reaching high intensity peaks with accelerations, decelerations and changes of direction. Goaltenders should mainly carry out anaerobic work. Physical preparation should be performed with load control and periodization.
- Joint mobility: mainly in hip and ankle.
- Core strengthening: strengthening in the abdominal, gluteal and lower back muscles.
- Muscle prevention guidelines, mainly thigh muscles. Eccentric work.
- Ankle and knee proprioception.

3.2 Handball

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1. Handball general characteristics

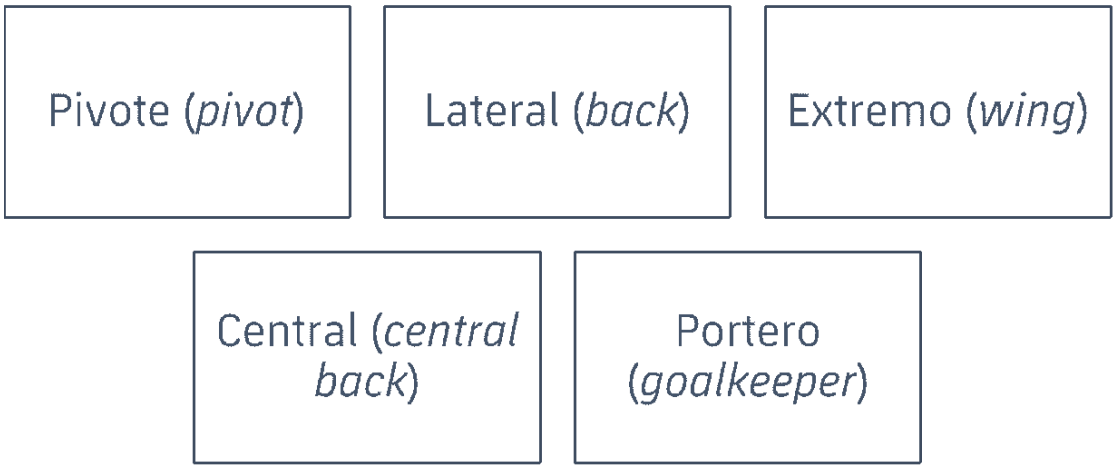
Handball is a sport that had its Olympic debut in the Olympic Games in Munich in 1972 (Melendez-Falkowski, 1992). Nevertheless, its definitive standardization was in 1936, with bases that probably derive from sports like urania games (Greek) or the harpastum (Roman).

In handball, each team has 7 players on court, including a goalkeeper. Each team's substitute bench can be constituted by 7 or 9 players, depending on the type of competition. The court size is 40 meters in length and 20 meters in width, so each court half is a square of 20 meters. One of the main characteristics in this sport is the great amount of physical contact, jumps, changes of direction and ball throwing with or without support. Opposition actions and the constant strength work condition performance and the injury incidence.

During the game, players are not allowed to touch the ball with their feet and to walk without shooting the ball, except goalkeepers in the goal area. Scores are made by putting the game ball into the opposing team's goal with a shooting. It is played in two 30-minutes halves, although in minor leagues each half lasts 25 minutes. There are no limits when making changes in relation to quantity and frequency. The only limitation is the way and the moment in which they are carried out. Game positions are divided in five as follows:

1 Opinions and content in this work represent the author criteria and not the organization entity's one

Figure 8: Game positions



Source: own creation based on the Real Spanish Handball Federation, 2010.

Within these positions we can find three different functions from a tactical point of view:

- goalkeepers;
- first attack line (central back and backs);
- second line (wings and pivots).

Characteristics of players according to their positions and functions inside the game

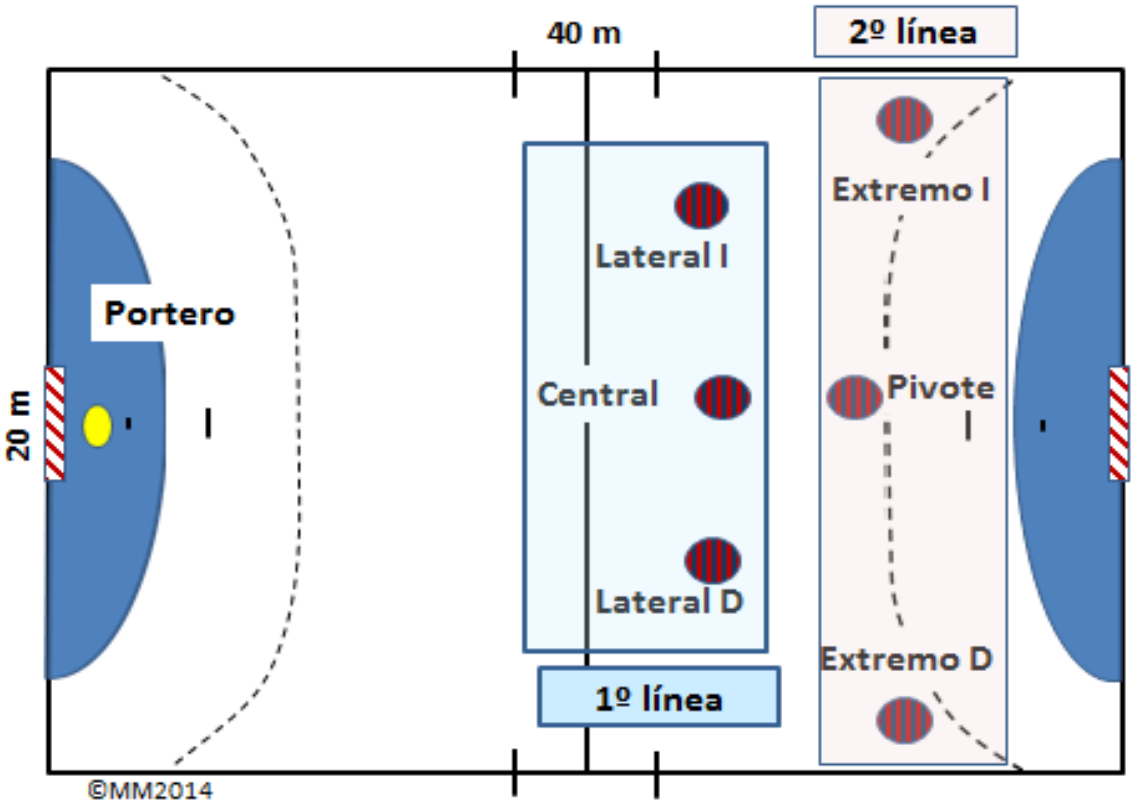
- ***Pivots:*** with a robust build and located inside the opponent´s defensive lines, they perform the role of opening the defense, creating and generating spaces for their teammates´ actions.
- **Wings:** as the name indicates, this type of disposition inside the court belongs to those players that, initially and during the whole match´s process, remain located on the right and left sidelines. A special feature that characterizes these players is their speed, agility and their ability to jump.
- ***Central backs:*** they are called first line players. They are located among the backs during the game. They are essential in the game coordination, mainly in attacking, since they are the ones who initiate it; they stand out because of their wide game vision and game ability.
- **Backs:** they are located on each side of the central backs and their function in the game court is to "break" the defensive lines proposed by the opponent´s team,

when they are presented as closed from the 9-meters line. Their descriptive characteristic locates them as high and stocky players.

- **Goalkeepers:** they are characterized by their wide ballistic movement amplitudes on inferior limbs when stopping a shooting. This goes together with agility and ability for an ocular and motor response. Although the injury incidence of these players is low in comparison with other positions, they show a typical injury pattern. Higher amounts of injuries in ischiotibials and adductors, in face and head and in specific parts of the elbow. In relation to the rules, they are the only players allowed to take steps with the ball without throwing it within the goal area, as we previously mentioned. Outside this area, they are subject to the same restrictions as any other player. They should be dressed differently to the rest of the players, so they can be easily identified. (Real Federación Española de Balonmano, 2010) (Real Spanish Handball Federation) (Mohamed et al., 2009) (Zapartidis I, Kororos P, Christodoulidis T, Skoufas D, Bayios I, 2011) (Ghobadi H, Rajabi H, Farzad B, Bayati M, Jeffreys I, 2013).

According to descriptions made so far, players have, according to their position and function inside the game court, anthropometric characteristics and specific requirements, even if they are grouped in relation to the attack line, as it can be seen in Figure 9.

Figure 9: Players´ position according to regular tactics and technique



Source: Mónaco, 2015, p. 21.

Portero	Goalkeeper
Lateral I	Back I
Central	Central back
Lateral D	Back I
1° línea	1st line
2° línea	2nd line
Extremo I	Wing I
Pivote I	Pivot I
Extremo D	Wing D

In handball, different categories are presented and they are divided by age. So, following each category, rules are modified and adapted during competition.

Within this rule´s division and adaptation, we can find, for example, the change of players during competition. In child and junior categories, we can observe that there are no changes in defense situations, in other words, they only take place when they are in possession of the ball (when the team has the possibility of attack). These types of rules show, in these categories, a less specific game, and, at the same time, that the intensity

of the actions performed during the match are conditioned. In relation to what was exposed, and in contrast to previously mentioned categories, in senior and junior categories these changes can take place in an attack situation as well as in a defense situation.

These differences will condition the game model and performance, and these last two will be influenced, in turn, by coordinative and physiological factors in each individual in the different age categories (Mónaco, 2015). In fact, Fernández Vila and Rodriguez (2004) determine that the best moment for the detection of talents in handball is at the ages of 14 and 15.

Following descriptions, we can see how the different variables must be taken into account for the epidemiological analysis of injuries that occur in this sport.

2. Injuries in handball

Injury risk factors and injury mechanisms

Handball is an interaction sports in a shared space, in which there are permanent physical demands. These demands can be intermittent or in intervals.

During competition, different motor actions are performed. Displacements occur in reduced spaces and they are carried out through changes of direction, high intensity sprints with displacements in different directions, with a great number of jumps and acceleration and deceleration movements. In this contact sport, we can also see the block to opponent players´ movements, as well as the dribbling and the ball passing, which are some of this activity´s special features and which are presented as game conditioners in the injury mechanisms (Mónaco, 2015).

As most contact sports at high intensity and speed, the injury risk is higher with the increase in these actions´ frequency and power.

Handball intrinsic risk factors

According to Karanfilci and Kabak (2013), the determining factor operating in relation to **age** and the existence of injuries is in the increase of the amount of exposition hours, instead of the early specialization as the only cause. Taking the age analysis as a base might be a discussion area, given its controversy. Anyway, this indicates that there is not a clear relation established between age and the total injury incidence.

However, there is a certain association between localization and affected structure according to the chronological age. Many times, the age analyzed as an age category is mainly conditioned by the competitive level or progression, more than age as the only conditioning factor. That is why, most studies put the senior or professional category as the one with highest injury incidence.

Apophysitis and spondylolysis are prevalent in young players and muscle injuries in seniors.

Most frequent localizations in adults are the following:

- ankle, thigh and head; however, knee is a prevalent localization at all ages. (Mónaco, 2015).

Women show a total injury incidence that is a bit higher than in men in a thousand hours of exposition and they have three times more risk of suffering from an anterior cruciate ligament injury, in relation to men (Mónaco, 2015).

An intrinsic risk factor is the injury recurrence. This can be affected by a hurried return to competition, as a consequence of rules that allow using multiple players.

Within the extrinsic factors we can find the following:

Table 1: Handball extrinsic risk factors

Game situation	There is a higher injury risk in the major leagues and in competition, in comparison to training sessions. At the same time, the more important the competition is (international events or Olympic games), the more intense the game and the better the players´ physical characteristics, which will generate an increase in the number of injuries.
Game position	Although the authors that have studied this topic did not find significant differences in the injury incidence based on the game position, we should highlight that the game demands and the injury mechanisms will be specific for each position (Mónaco, 2015).
Game surface	Studies have shown a higher index of ACL injury (anterior cruciate ligament) on artificial surfaces with a higher friction coefficient in comparison to wood surfaces (Mónaco, 2015).
Situations during the match	In relation to the moment in which the injury occurs, some authors describe a bigger incidence after 10 minutes in each part; others describe it in the second half. However, studies cannot be compared because the type of population studied and the level of competition are different between each other. Other authors describe the attack situations as the ones in which injuries are more frequent, which would justify that central backs are more affected. Most injuries occur during the physical contact, except the ACL injury that occurs in non-contact situations (Mónaco, 2015).

Source: own creation.

Injury patterns and types:

To the present day, different scientific studies have been exposed, studies in which diverse characteristics are presented in the sample. According to collected data, we can

observe that the ankles as well as the knee are the most frequent areas in relation to injury localizations (Mónaco, 2015).

However, other authors invert this order (Backx, Beijer, Bol, Erich, 1991; Olsen, Myklebust, Engebretsen, Bahr, 2006) or, as an exception, they determine the head as the main injury localization (Langevoort, Myklebust, Dvorak and Junge, 2007), followed by fingers. In these cases, the differences in the order are conditioned by the type of studied competition and population (Mónaco, 2015).

On the other hand, in recent years, shoulder injuries are not among the two most frequent ones. This disposition reveals a clear orientation in relation to the importance of the evolution of prevention programs introduced in the training process during the last twenty years. In relation to the most common conditions, the following are mentioned: joint sprain, non-traumatic muscle injury and contusion.

This way, and following the research line of different authors, there is a relation between the specific injuries and the game position that players take during competition.

It is important to highlight that elbow injuries and lower back pains show significant levels in adult women goalkeepers.

Finally, the minor leagues show a higher prevalence of apophysitis and lower back pains, in up to the 20 % of cases (Mónaco, 2015). In this last case, spondylolysis and olisthy represent the most severe injuries in this sport, in relation to the great recurrence risk (Mónaco, 2015).

Injury incidence and severity

The total injury incidence (II) varies from 2,5-6,6 * 1000 total exposition hours. The Injury Incidence in competition/training sessions 9,9-21,8/0.6-4,6 respectively. The highest values are registered in international competitions and Olympic Games.

Injury severity varies according to categories; it is higher in senior categories than players in formative years (Mónaco, 2015).

Frequent injuries in handball

- **Concussion**: it is frequent in opposition situations (attack) among players or against the ball (goalkeepers).
    - This injury's presence or suspicion requires the removal of the athlete from the court until symptoms are completely interpreted.
    - Its monitoring requires the use of the SCAT 5 with a standardized protocol for a graduated return. (McCrory, Meeuwisse, Dvorak, Aubry, Bailes, et al. 2017; Ledoux, Barrowman, Boutis, Davis, Reid et al. 2017).

- **Ocular trauma**: it has a low incidence in this sport. Frequently, it occurs as a consequence of a facial trauma — on goalkeepers (because of the ball) in general— or ocular trauma in attack-defense situations with the opponent´s fingers.
    - Here the use of resin in hands takes on a special importance as an aggravating factor.
- **The knee:** it is one of the most frequent localizations, as we have already mentioned.
    - The ACL in forced valgus and flexion mechanisms is the most frequent injury with a bigger incidence in women (Myklebust, Skjølberg, Bahr, 2013; Caine, Purcell, Maffulli, 2014). The elected procedure is surgical, with tendon-bone technique (the patella tendon), mainly when the body index mass is high and there is joint hypermobility.
    - The posterior cruciate ligament (PCL) injury goes unnoticed many times and it does not always require a surgical procedure.
    - The medial collateral and lateral ligaments require a traditional treatment in most cases (Olsen, Myklebust, Engebretsen and Bahr, 2006).
- **Hand and wrist**: they have a leading role in this sport. Acute traumatic injuries in hands and fingers do not usually generate absences in sports.
    - Finger dislocations and metacarpal fractures have to be differentially diagnosed in case of trauma.
    - The scaphoids´ fracture requires special attention, since the insidious evolution goes many times unnoticed; in this case, the CT (Axial Computerized Tomography) is the elected diagnosis method (Gregory, Kerr and Parsons, 2016).
- **The handball player´s elbow**: it has various clinic symptoms manifestations.
    - The medial collateral ligament injuries, as well as the elbow's chondral injury from repetitive trauma are typical in goalkeepers, but they are not determinant.
    - Strength work is the best preventive strategy, together with the dosing of training loads (Piry, Fallahi, Kordi, Rajabi, Rahimi, Yosefi, 2011; Tyrdal and Bahr, 1996; Gregory, Kerr and Parsons, 2016).
- **The shoulder**: its assessment is especially significant when the affected area is the dominant side or the shooting side. Acute injuries, like luxation, are associated to Hill Sachs and/or Bankart injuries, which can condition the player´s sport future. Joint instability requires a rehabilitation treatment from the beginning, regardless

that the surgical criterion is used or not. In this case, the Latarjet procedure is the elected one (Gregory, Kerr and Parsons, 2016).

The detection of the injury predisposing factors during the medical exam, the planning of a prevention program based on this information and the games during the season are the best strategies for prevention. In order to achieve that, the interdisciplinary work with the technical staff is essential.

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