

BETWEEN BASKETBALL AND RUGBY

THE RISK OF INJURY IN HANDBALL

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INTRODUCTION

Handball is a high-intensity sport with frequent physical contact between players. The physical demands are characterised by intermittent sprinting. Match play involves high-speed running forwards, backwards as well as sideways, plant and cutting movements, jumps, landings, turns, and repeated acceleration and deceleration movements. Most of the play in handball involves balancing on one or two legs while catching, bouncing (dribbling) or throwing the ball with one hand. With rough tackles and frequent body checking, there is an obvious risk of injuries in handball.

The objective of this paper is to review the literature on handball injuries, presenting the data available on injury risk and the pattern of injury among handball players. In addition, information on the consequences of injury will be presented.

WHAT IS THE RISK OF INJURY IN HANDBALL?

In the first prospective study on handball injuries, in 1984 Nielsen & Yde¹ reported

injuries among 7- to 18-year-old players in one Danish sports club. They documented an incidence of 10 injuries causing time-loss from training and/or competition per 1000 match hours (11 in girls and 9 in boys). In contrast, in 1997 Wedderkopp et al² completed a retrospective study, also in Danish handball, where they found that young female players had a much higher injury incidence with up to 41 injuries per 1000 match hours. In their subsequent prospective intervention study³, the incidence was reported as 23 injuries per 1000 match hours. However, since both these studies included all injuries, not just injuries causing time-loss from sports, the apparent difference in injury incidence was probably caused by a difference in the injury definition used.

Among senior players we see similar injury rates as those of young players, with 12 to 14 injuries per 1000 playing hours^{4,5}. The rate reported depends on the injury definition used (time-loss injuries or all injuries). There is only one prospective study available from the highest professional

level, relying on injury reports from team medical staff during six major international tournaments. This showed that the incidence of time-loss injuries was as high as 40 injuries per 1000 match hours for men and 36 injuries per 1000 match hours for women⁶. The overall incidence of injury (including all injuries, not just those causing time-loss) was on average 108 injuries per 1000 player hours. Assuming that one match of 60 minutes corresponds to 7 match hours of exposure per team, this means that each team can expect approximately 0.7 injuries each match or one injury causing time loss from sports participation every fourth match played.

That the injury risk in handball is substantial was confirmed through the International Olympic Committee (IOC) injury surveillance study from the most recent Summer Olympic Games. In this study by Engebretsen et al⁷ they reported that 22% of handball players suffered from an injury during the 2012 London Games. When compared to other Olympic team sports, the injury risk appears to be considerably lower



Figure 1: The main injury location presented in the literature caused by a mixture of acute and overuse injuries. Photo: Svein André Svendsen. Reproduced with permission.

verified by Moller et al⁹, where this was the most common overuse injury type⁹.

Upper extremities

Acute injuries to the upper extremities are frequent and different studies present numbers ranging from 7 to 50% of total injuries^{1,2,4,6,8,14,20}. Shoulder and hand/finger injuries are most common. Finger injuries are more often observed among young players.

Knowledge of overuse injuries in the upper extremities is sparse, but a study among German male players showed that 40% of the 25 players examined had been limited by shoulder pain during training and play during the previous 6 months²¹. The high prevalence of shoulder problems have later been confirmed in a study among elite female Norwegian players. Among the 178 players tested, 57% reported present or previous shoulder pain. Forty-nine (67%) of those players who had reported pain were limited by reduced training performance and 24 (34%) could not play matches because of pain²².

Head injuries

Some studies have reported a high number of head injuries in top level handball. In a study by Asembo and Wekesas²³ they found that 43% of injuries among males were located to the head and neck, while the proportion among females was substantially lower with 16%. These results were confirmed in data from Langevoort et al⁶ from international level players with 29 and 31%. It is interesting to note that there seemed to be few concussions among these injuries, and one might expect that most of these injuries are blows to the face, nose or possibly teeth. One hypothesis is that concussions are not recognised and therefore under-reported in handball, which is a phenomenon well known in other sports^{24,25}. There is insufficient knowledge

than football (35% of players injured during the Olympic tournament), but substantially higher than basketball (11%) and volleyball (6.9%). Most studies have not reported much of a gender difference in injury risk among youth players¹⁸. The exception is the study from the London Olympic Games, where a higher overall injury rate was reported for women than men (26 vs 17%)⁷. In contrast, in a study by Moller et al⁹ a higher incidence of acute injuries was found among male U16 and U18 players compared to females⁹.

ACL injuries

Several studies have reported on the incidence of anterior cruciate ligament (ACL) injuries in handball. In a retrospective study published in 1990, Strand et al¹⁰ found that the ACL injury incidence was highest among women playing at the top level with 0.82 ACL injuries per 1000 playing hours compared to male players with 0.31 injuries per 1000 playing hours¹⁰. The relatively high incidence of ACL injuries among female players, particularly at the elite level, has later been confirmed by prospective studies¹¹⁻¹³. The highest ACL incidence is described from elite female handball in Norway with 2.29 ACL injuries per 1000 match hours¹³. This corresponds roughly to each team losing one player to an ACL injury every season.

WHICH BODY PARTS ARE AT RISK?

Lower extremity

The majority of acute injuries in handball are located in the lower extremity, regardless of age and gender^{1-5,9,14-16}.

The most frequent injury location reported in handball is the ankle (8 to 45%), while the most serious injuries are knee injuries (7 to 27%), including injuries to the ACL. An ankle injury is usually not very serious; typically an ankle sprain needs only a few days off from training and matches. In contrast, an ACL injury will require a reconstruction of the torn ligament for most players. A rehabilitation time of 6 to 12 months is necessary for these patients to be able to return to their pre-injury activity level¹⁷.

There is an apparent gender difference in ACL injury incidence in team sports. Female athletes suffer ACL injuries 4 to 6 times more often than their male counterparts taking part in the same sports at the same level. The high incidence in handball, especially among females, represents a significant challenge. The good news is, however, that prevention is possible through specific training programmes^{13,18,19}.

Few studies report on overuse injuries but in a study by Olsen et al (2006)⁸, lower leg pain ('shin splints') was reported to be the most common problem⁸. This was



Figure 2: Distribution of acute injuries among 517 male and female youth and senior elite handball players. Information based on Moller et al, BJSM 2012. Photo: Svein André Svendsen. Reproduced with permission.

Match injury distribution

Few studies have reported details regarding time of the injury, but in the study of Langevoort et al⁶ among international players, the incidence of injuries increased toward the middle of each half and decreased towards the end and 45% of the injuries occurred in the middle 10 minutes of both halves⁶. In the study by Asembo and Wekesas²³, 57% of the injuries occurred in the second half. Since we do not know anything about when the players sustained an injury in relation to the exact time (minutes played), it is not possible to draw any conclusions from this information. One might suspect that players playing a full match are the ones at the highest risk, but we do not know if this is the case. In a study among 215 ACL-injured female players, 146 (68%) injuries occurred in match play. Of those, 63% happened in the first half and 37% in the second half of the match (Myklebust G, unpublished data).

Shoe-floor interaction

Handball is played on different floor types with varying quality regarding friction and shock absorption. The floors are usually of two types: parquet (wooden floors) or artificial floors. Shoe-surface interaction has been studied as a risk factor for ACL injury in different sports. In handball, it has been shown that the risk of ACL injury is 2.4× greater when competing on artificial floors compared with wooden floors³⁰. However, it is important to note that this is probably not a result of the floor material (wood vs synthetic composite) per se, but rather that many of the synthetic floors included in this study were older floor types which tended to have a high friction. Nevertheless, there seems to be little doubt that the shoe-surface playing interface is an important factor to consider when developing intervention strategies to reduce the rate of serious knee injuries, although more research is needed.

WHAT ABOUT OVERUSE INJURY?

Acute injuries occur suddenly and have a clearly defined onset or cause, while overuse injuries occur gradually. The

of head injuries in handball and this is an area that needs to be focused on in future studies. We know from studies on football that head injuries can be serious and more attention towards prohibited behaviour/foul play is necessary²⁶. One way to reduce these injuries is to work with referees to limit brutal and unfair play through stricter penalties.

Other types of injury

The most common types of acute injuries in handball are muscle and ligament sprains (2 to 68%) and contusions (2 to 36%). Fractures and dislocations are usually less common, except for the studies of Fagerli et al¹⁴ and Asembo and Wekasa²³, which showed a high proportion of fractures: 19 to 22% and 31%, respectively. The study of Fagerli et al¹⁴ was based on patients treated in the emergency room, which could explain the high proportion of fractures, while the Asembo and Wekesas²³ study was done among elite level male players. Their findings have not been replicated in injury surveillance on the elite international level⁶, where fractures represented only 1 to 2% of injuries.

Two studies are available reporting on specific diagnoses of jumper's knee and

elbow problems among handball players. A study on jumper's knee among national elite players showed that the prevalence among females was 10%, and 30% among male players²⁷. Another study²⁸ aimed to survey elbow problems among handball goalkeepers, documenting that 41% of 729 players experienced elbow problems. The injury mechanism appeared to be repeated hyperextension traumas and the condition was termed 'handball goalie's elbow'²⁸.

WHEN DO INJURIES HAPPEN?

Match play vs training

There is no doubt that the incidence of all types of injury is higher when playing a match than during training^{1-5,8,9,15,29}. The high incidence of injuries observed in Olympic tournaments and World Championships reinforces the high injury risk in matches, especially at the highest level⁶. At the London Olympics, 75% of the injuries occurred in match situations and 25% in training⁷. This picture is approximately the same for other adults and for adolescents, and for both genders. In contrast, when we look at ACL injuries there is an 8× higher match incidence among males compared to a 30× higher match incidence among females¹¹.

majority of injuries reported in handball among both adolescent and adult players are acute injuries to the lower extremity. In studies reporting on both acute and overuse injuries, the proportion of overuse injuries ranges between 7 and 37%^{1,2,8}. In a study by Olsen et al⁸ among youth players, 21% of the injuries reported were overuse injuries. In a recent study by Moller et al⁹ among 517 youth and senior male and female elite players, the proportion was somewhat higher – 37% were overuse injuries (Figures 2 and 3)⁹. However, it should be noted that the prevalence of overuse injuries is most certainly underestimated in these studies. Overuse injuries are often not captured in standard injury surveillance studies, since most studies use the ‘time-loss’ definition.

Injury severity

Injury severity is usually classified according to the duration of time-loss from training and competition. An injury causing more than 3 or 4 weeks of absence is usually said to be severe. Studies have shown that 5 to 48% of injuries are severe^{1,3,4,6,8,15,31}.

In a study by Olsen et al⁸ among youth players, 36% of the acute match injuries and 48% of the overuse injuries were severe

injuries (>21 days absence). In the London Olympics 5% of the handball players had injuries that gave more than 7 days of absence from competition and training. Furthermore, 81% of the severe injuries occurred during competition⁷.

Serious knee injuries such as ACL injuries and meniscus injuries typically result in long time absence. In addition, ankle and head injuries are the most frequent injured body parts leading to absence.

WHAT ARE THE LONG-TERM OUTCOMES?

Injuries can affect performance beyond the time lost from sport. There is an increased risk of re-injury. Physical fitness and performance may be reduced, perhaps even permanently. In addition, there could be time lost from school and work. In the study by Nielsen and Yde¹, they found that 41% of injured players still had complaints 6 months after the end of the season.

Moller⁹ found that having had two or more previous severe injuries increased the risk of a new injury among the U16 players⁹. Studies from football have shown that a previous injury to the ankle or knee gives a five-fold increased risk of a re-injury to the same joint³². A study among handball

players showed that the risk of a re-injury of a reconstructed ACL was 13%, all of them after returning to match play in handball³¹.

An ACL injury is a serious injury with potential long-term health consequences. Osteoarthritis (OA) is a definite risk, whether the patient has surgery or not. Persons with knee OA suffer from swelling and pain, loss of knee range of motion and often altered function with diminished muscle strength³³. In follow-up of handball players with an ACL injury, Myklebust et al³¹ showed that 6 to 11 years after injury, the prevalence of radiological OA was 42% in surgically treated patients and 46% in those who did not have surgery. The high risk of OA after ACL injury has been shown by von Porat et al in a study on football players³⁴. Another question is whether handball play increases the risk of OA even when no injury has been recognised, but from the loading itself. A study by L’Hermette et al³⁵ found that the risk of developing premature hip OA was high for retired handball players and significantly greater than for the general population. They examined 20 former male handball players and 39 control subjects and found that 60% of the handball players were diagnosed with OA in at least one of the hip joints compared to only 13% of the control subjects³⁵.

CONCLUSION

Handball injuries are quite common, and mostly acute injuries occur in the lower extremities, such as ankle and knee sprains. The most common overuse injuries are in the shoulder, knee and lower leg. More injuries are recorded in match play than during training sessions. Future research should emphasise overuse injuries, since this is a problem which has most likely been underestimated in previous studies, which have focused mainly on time-loss injuries. Prevention of handball injuries is a key factor to reduce the injury burden.

References at www.aspetar.com/journal



Figure 3: Distribution of overuse injuries among 517 male and female youth and senior elite handball players. Information based on Moller et al, BJSM 2012. Photo: Terje Anthonson. Reproduced with permission.

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