

## Examination of Risk Factors of Injuries between Genders in Beach Handball

Dimitris Hatzimanouil<sup>1</sup>, Ilias Zapartidis<sup>2</sup>, Ioannis Terzidis<sup>1,3</sup>, Efthymios Papasoulis<sup>3</sup>  
Chrysa Chronopoulou<sup>4</sup> & Aliki Makri<sup>2</sup>

### Abstract

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The aim of this study is to examine the injuries between genders. The study was conducted on 61 female and 60 male beach handball players that were participating in the EBT finals in 2016. These players completed a questionnaire which included information on personal characteristics, on prophylaxis and on characteristics of injuries. Incidence rate for men and women during games and trainings was 8.04 / 1000 hours, and 3.06 / 1000 hours and 7.9 / 1000 hours, and 2.75 / 1000 hours, respectively. The majority of injuries were very serious. The most common types of injuries were sprains and muscle strains for male in lower limbs (knee, ankle) and sprains in upper limbs (shoulder, elbow) for female. Contact injuries were more common than non-contact injuries for both genders. The chi-square test found that there is statistical significant difference between the gender and the place where an injury occurred ( $p=.045$ ). Kendall's tau-b test found that there is statistical significant correlation between the variable use of technical training and incidence of injuries in men ( $p=.046$ ). Conclusively in this sport although the incidence is small, the severity, in many cases is very serious. Sometimes there is a difference in risk factors between genders.

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**Keywords:** sand sports, incidence rate, severity

### 1. Introduction

Beach Handball is the newest member of the Handball family. Although its origins come from the indoor handball, it had, very fast, developed its own unique identity, as a beach sport. The easy setup, the summer ambience and the spectacle it offers, made it very fast, very popular. Its popularity grew so much that made the IOC to put it under consideration to include it, at some Olympic Games in the future. Recently the Union of National Olympic Committees (ANOC) include Beach Handball in the World Beach Games at San Diego (USA) in 2019. As its name implies, it's a sport that is played on the sand and compared with the other "sand" sports it has attracted very little scientific attention.

As Inklaar (1994), reported, causes and versions of injuries in every sport can be different among different subgroups of athletes. In the future, in order to reduce the rate of injuries in every sport it's useful to determine athletes in high risk, and to develop necessary preventive measures and means in the future. This study aims to examine the injuries between genders in beach handball. More specifically to record the frequency and the seriousness of injuries and also to correlate them with the risk factors of this sport.

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<sup>1</sup>Laboratory of evaluation of human biological performance, Faculty of Physical Education and Sports Sciences, School of Physical Education and Sports Sciences, Aristotle University of Thessaloniki, Greece. Email: [xatjiman@phed.auth.gr](mailto:xatjiman@phed.auth.gr)

<sup>2</sup>School of Physical Education and Sport Science, National and Kapodistrian University of Athens, Greece

<sup>3</sup>The MIS Center of Orthopaedic Surgery, Thessaloniki, Greece

<sup>4</sup>Athens University of Applied Sciences, Physiotherapy Department, Athens, Greece

## 2. Materials and Methods

### 2.1 Participants

This study was contacted on 121 beach handball players (61 female and 60 male), that were participating in the EBT Finals, that took place in Thessaloniki, Greece on the 20<sup>th</sup> to the 22<sup>nd</sup> of May 2016. All the participants received complete information about this study from the Organizing Committee at the technical meeting.

### 2.2 Measurements and Procedures

A questionnaire that included information on personal and demographic characteristics of each player. More specifically namely, sex, age, weight, height, athletic background, education level, profession, accommodation during tournament etc. In the questionnaire was also included various useful information such as previous injuries that the players have suffered in the last 2 years and additionally if there are any precaution equipment or specific training as a part of everyday practice. According to Hatzimanouil, Oxizoglou, Kanioglou, Manavis, &Stefas (2008), as injury is defined “an accident sustained during practice or competition, which led to a medical problem and prevented participation for at least one day beyond the day of occurrence”. Mechanisms and types of injuries and also severity, frequency and localization, in practice or in a game, were mentioned in the questionnaire as well.

Every player completed its own questionnaire, voluntary, in the presence of the researchers, who were ready to answer any question that the athletes might have had about the research, at the venue of the games. In total, from the 200 players that participated in the tournament, 121 have completed the questionnaire that makes 60.5% of the players.

### 2.3 Statistics

The statistical analysis of the data was made with the SPSS 21 (IBM, USA) and included the calculation of the mean and the frequency of each variable. Also the chi-square test was used to examine the relation between the incidence and the severity of an injury with any other variable and the Kendal’s tau-b test was used to examine the relationship between two ordinal variables. Level of significance was determined at 0.05.

## 3. Results

Table 1 shows the personal data of the participants in the study, regarding age, height, weight, body mass index (BMI), and years of training in team and in beach handball respectively. In terms of education 36.7% men had attended basic education, 43.3% higher education and 20% postgraduate studies. The largest percentage (50%) was employed in the private sector as employees, while the lowest percentage was employed in the public sector (6.7%). Moreover, a percentage of 6.7% was unemployed. It was remarkable that 16.7% said they were employed as professional handball players. The highest percentage of 95% of male athletes stayed during this tournament, in hotels in the area. The mean of the months that practiced team handball and beach handball were  $8.08 \pm 2.66$  and  $4.78 \pm 4$  months respectively. The mean of weekly training sessions in team handball and in beach handball were  $4.2 \pm 2.06$  and  $2.62 \pm 1.24$  trainings respectively. A 70% of male athletes stated that they are participating in this tournament as key players with their teams. Most (75%) said they were following a physical condition program during preparation for beach handball. Almost all said that during exercise they use stretching exercises (90%). Most of them, 71.7%, said that these stretching exercises used them during warm-up.

**Table 1. Personal data of study population.**

Parameter	Male (n=60)	Female (n=61)
Age (yrs)	$26.65 \pm 5.65$	$26.31 \pm 5.43$
Body Height (m)	$1.87 \pm 0.07$	$1.70 \pm 0.05$
Body Mass (kg)	$86.18 \pm 12.12$	$65.60 \pm 5.17$
BMI ( $\text{kg}\cdot\text{m}^{-2}$ )	$24.44 \pm 2.92$	$22.49 \pm 1.85$
Playing Experience Beach Handball (yrs)	$7.52 \pm 4.80$	$6.31 \pm 3.16$
Playing Experience Team Handball (yrs)	$14.4 \pm 5.60$	$16.13 \pm 5.74$

For education, 44.7% of female had completed basic education, 43.8% higher education and 11.5% postgraduate studies. The largest percentage (39.3%) was employed in the private sector as employees, while the lowest percentage was employed as professional handball players (8.2%). Additionally, 6.6% were unemployed. The largest percentage of female athletes 78.7% stayed during this particular tournament in hotels in the area.

The mean of the months that practiced team handball and beach handball were  $9.47 \pm 1.52$  and  $4.05 \pm 1.59$  months respectively. The mean of weekly training sessions in team handball and beach handball were  $3.64 \pm 1.51$  and  $2.94 \pm 1.22$  trainings respectively. An 86.7% of female players said they are participating in this tournament as key players with their teams. Most (85%) said they were following a physical condition program during preparation for beach handball. Nearly all said that during exercise they use stretching exercises (93.4%). The majority (82%) stated that the stretching exercises were used during warm-up.

Table 2 includes information for both genders on the prophylactic use of equipment, and technique exercises, the injury incidence rate, and treatment. In total 17 of the 60 men athletes reported a total of 23 injuries and 15 of the 61 of female athletes reported a total of 20 injuries during the last 24 months. The injury incidence rate for male beach handball athletes in our results was 8.04 / 1000 hours during games, and 3.06 / 1000 hours of training. The injury rate for female athletes was 7.9 / 1000 hours during games, and 2.75 / 1000 hours of training. Injuries occurred more frequent during trainings for male (62.5% of total injuries) while for female athletes injuries occurred more frequent during games (73.3% of total injuries). The most common type of injury was sprains and muscle strains for male and sprains for female players (Table 3). In male players the majority of injuries affected the lower limbs whereas in female players the majority of injuries affected the upper limbs (Table 4). More specifically, in male players the knee and the ankle were the body parts more commonly injured whereas the shoulder and the elbow were the regions more commonly affected by injuries in female players. Contact injuries were more common than non-contact injuries for both genders (Table 5a). In particular, contact with the opponent player was the most common mechanism of injury (Table 5b). Statistical analysis from the chi-square test found that there is statistical significance difference between the gender and the place where an injury occurred ( $p=.045$ ). More specifically male players presented more injuries during trainings while female players presented more injuries during games. Statistical analysis of injuries found no statistical significance difference between the incidence of injuries and all the variables for the male players. Similarly, there wasn't any statistical significance difference between the severity of injuries and all the variables for male athletes whereas from Kendall's tau-b test was found that there is statistical significant correlation between the variable use of technical training and the incidence of injuries in male players ( $p=.046$ ). In female beach handball players, there was also no statistical significance difference found between the incidence of injuries or the injury severity and all the variables.

#### 4. Discussion

Beach handball is a form of indoor handball. Most of the time an indoor handball player is also playing beach handball. From our results it seems that at the same player, training age between beach and indoor handball has a significant difference. More specifically players have a bigger indoor handball background. This happens because beach handball is a new sport in comparison with indoor handball.

Demographic data shows that most players are educated, work in private sector (44.65%) and only a small percentage plays professionally handball (12.45%). Most of the players (86.85%) stayed in hotels during tournament.

Most of the players (80%) participated in physical preparation of their teams before entering the tournament. 91.7% of the participants use stretching exercises during training in beach handball. More specifically a percentage of 76.85% use these exercises during warm up.

From the results of our study it is found that male beach handball players use prophylactic equipment more often (50%) in comparison to indoor handball players (38.9%) which was found by Hatzimanouil et al. (2008). At the same time female beach handball players (33.3%) use prophylactic equipment less frequently. The lack of prophylactic equipment in female indoor handball players it is shown that lead to an increase in injuries (Rasuli, Jafari, Moghaddam&Shotorbani, 2012). Prophylactic equipment is a preventive mean from injuries but in our study although male players use them more often and female less often, was not found any relation with incidence and severity of injuries.

From our results using Kendall's tau-b test was found that there is a statistical significant correlation between the two variables, the use of technical exercises during training sessions and the incidence of injuries in male players ( $p=.046$ ). Henke, Luig& Schulz (2014), reported that lack of technical training can lead to an increased possibility for chronic and acute injuries in indoor handball.

Moreover our results revealed that there was a decrease of the percentage of total injuries for both genders in comparison to the results of EBT (2014) which showed 68% in male and 62.5% in female players (Hatzimanouil et al. 2017). Similarly, in our study there was a decrease in injury incidence rate during games for male and female respectively (8.04/1000 hours and 7.9/1000 hours) in regard to EBT (2014).

It is remarkable that in injury incidence rate during trainings for male there was an increase while in female there was a decrease in comparison with the results of EBT in 2014 (3.06/1000 hours for male to 1.8/1000 hours and 2.75/1000 hours for female to 4/1000 hours) (Hatzimanouil et al., 2017). One possible reason for the above increase in men is competitiveness in trainings due to the constant enhancement of the level of the players involved.

Furthermore Myklebust, Skjolberg & Bahr (2013) and Moller, Attermann, Myklebust & Wedderkopp (2012), stated that recurring injuries appear to be more frequent when there were previous injuries particularly to lower extremities. In our study we found high percentage in injury recurrence (58.8% for male and 40% for female). These findings are more increased in regard to EBT (2014), in which tournament had been found a percentage of 13.2% for male and 13.6% for female players. One possible cause is the constant increase of intension in trainings and games because of the up growth of the game in general.

From our results it is showed that most of the players in both genders were more prone to one injury during the last 24 months. Thus few players in both genders reported more than one injury during the last 2 years. These news are good if we take into consideration that in EBT 2014 the percentage of the players who had more than one injury was bigger (Hatzimanouil et al., 2017).

Another remarkable result of our study was that there is statistical significance difference between the gender and the place where an injury occurred ( $p=.045$ ). It seems that male players presented more injuries during trainings while female players presented more injuries during games (Table 2). One possible reason is that trainings in male players have more intensity than trainings in female players.

As it regards the treatment it seems that most players of both genders followed conservative treatment. Consequently few injuries in both genders need surgical medical care.

Sprains and muscle strains are the most common type of injuries in men while in female players sprains are the injury with the biggest percentage (Table 3). It is remarkable that none of women reported muscle strain, fracture and meniscus injury as a type of an injury that had sustained during the last 24 months. Olsen, Myklebust, Engebretsen, Holme & Bahr (2003) and Olsen, Myklebust, Engebretsen & Bahr (2004), reported that muscle strains are the most common injury in indoor handball. Another interesting finding of our study was that except sprains, 35.7% of female players reported subluxation / dislocation as a type of injury. Although Henke et al. (2014) and Moller et al. (2012), claimed that lower limbs are the most common site of injury in team handball, our results revealed that in this specific tournament, in contrast with men, female athletes reported that upper limbs (60%) were the most common site of injury. Men players reported that knee and ankle were the body parts more commonly injured while female players claimed that shoulder and elbow were the body parts frequently affected from an injury (Table 4).

Hatzimanouil et al. (2017), reported that injuries most commonly occur in contact situations. Our results are similar with the above authors as we can see that for both genders (66.6% for men and 66.7% for women) contact situations was the main mechanism of an injury (Table 5a). Henke et al. (2014), reported that contact situation is the main mechanism of an injury also in indoor handball. In our study collision with an opponent was the most frequent mechanism of injury for men and women although female players presented a bigger percentage (60%) (Table 5b).

The time of absence from training determined the severity of injuries in our study. From the results showed that in male athletes the severity was very serious and moderate while in female athletes was small and very serious. These results present the severity of injury for a big percentage of both genders very serious (Table 6). Also we must take into consideration as we mentioned before first that most of the times most of the players in both genders were more prone to one injury during the last 24 months and second that most of the times the treatment was conservative. From this finding we can say that although a lot of players reported one injury, this injury a lot of times was very serious and although it was very serious most of the times the treatment was conservative.

In our study the sample although 60.5% (121 players) answered the questionnaire it must be taken under consideration that the sample was small. Furthermore the study was based on a self-reported anonymous questionnaire and we must consider about the reliability of the survey.

In the literature a lot of times we can find contradictory results about sports injuries and that is because of using tools with low reliability (Salman, 2014). Moreover our sample was elite beach handball athletes thus some of the results might not refer to beach handball recreational players. Consequently the above considerations should be taken into account while examine the results of our study and specifically in this tournament.

**Table 2. Gender differences in relation to prophylaxis and characteristics of injuries**

Parameter	Male (%)	Female (%)	<i>p</i> -value
Use of protective equipment	50.0	33.3	0.06
Technical training	90.0	95.0	0.29
Incidence of injuries	28.3	24.6	0.12
Past injuries*	58.8	40.0	0.28
More than one injury	10.0	4.90	0.28
Injury during game	37.5	73.3	0.05
Treatment (conservative)	76.0	92.9	0.21

\* > 24 months on the same site as the one reported on this survey

**Table 3. Gender differences in relation to the type of injuries.**

Parameter	Male (%)	Female (%)	<i>p</i> -value
Sprain	26.7	42.9	0.35
Muscle contusion	6.7	21.4	0.24
Muscle Strain	26.7	0.0	0.03
Fracture	13.3	0.0	0.15
Subluxation/ Dislocation	13.3	35.7	0.15
Meniscus injury	13.3	0.0	0.15

**Table 4. Site of injury.**

Body part injured	Male (%)	Female (%)
Upper limb	20.0	60.0
Shoulder	7.14	10.71
Elbow	0.0	3.57
Torso	20.0	13.3
Head	7.14	0.0
Back	0.0	7.14
Lower limb	60.0	26.7
Knee	19.04	0.0
Ankle	2.38	16.67
Sole	0.0	4.75
Toe	0.0	14.28

**Table 5a. Rate of contact and non-contact injuries. Gender Differences**

Mechanism of injury	Male (%)	Female (%)	<i>p</i> -value
Contact	66.6	66.7	0.34
Non contact	33.4	33.3	0.34

**Table 5b. Injuries based on mechanism of injury. Gender differences**

Mechanism of injury	Male (%)	Female (%)	<i>p</i> -value
Collision with opponent	43.8	60.0	0.36
Collision with teammate	6.3	6.7	0.96
Collision with object	0.0	6.7	0.29
With the ball	6.3	20.0	0.25
Alone without ball	6.3	0.0	0.32
Other	37.5	6.7	0.04

**Table 6. Severity of injury. Gender differences**

Absence from training (weeks)	Male (%)	Female (%)	<i>p</i> -value
Small (0-1)	6.7	46.7	0.01
Moderate (1-2)	33.3	13.3	0.19
Serious (2-4)	13.3	6.7	0.54
Very serious (>4)	46.7	33.3	0.45

## 5. Conclusion

Generally in this sand sport although the incidence is small, the severity, in many cases is very serious. Risk factors in beach handball are similar to indoor handball while in some cases there is a difference in genders (between male and female players). More studies must provide more results, information and data about beach handball and its risk factors for injuries to help beach handball players to prevent their injuries.

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