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# Injuries in elite athletes of beach handball

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## ABSTRACT

Beach handball is a growing sport without available scientific data on the type of injuries that occur. The aim of this study is to record the incidence rate, type and severity of injuries in this sport. During the finals of the European Beach Tour 2014, 122 beach handball players completed a self – report questionnaire about the injuries they had sustained during the previous 24 months. The injury incidence rate for male and female was 12/1000h and 11.36/1000h respectively during games, and 1.8/1000h and 4/1000h during training accordingly. Muscle strains were the most common type of injury, while the majority of injuries affected the knee. The return to sports period was within 2 weeks from injury for 62% of male and 64.5% of female athletes. Statistical analysis could not correlate the incidence or severity of injuries in beach handball to any of the analyzed variables. This study showed that injuries in beach handball are similar to team handball, rather than to other “sand” sports. **Key words:** BEACH HANDBALL, INJURIES, INCIDENCE RATE, RETURN TO SPORTS.

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## INTRODUCTION

Beach handball is a type of team handball, but is played on the sand instead of an indoor floor. Due to the easy set-up of the game and desirable playing location, the sport quickly grew in popularity. Nowadays, professional and amateur leagues exist in many countries across Europe. Recently, beach handball was included in the program of the Youth Olympic Games to be held in 2018.

Beach handball belongs to “sand sports”, just like beach volley and beach soccer. It is noteworthy, however, that compared to other “sand sports” there is a lack of scientific research for beach handball.

The cause of injuries in each sport and its versions can differ between different subgroups of the athletes' population. Identifying those athletes in high risk for injuries can lead to the development of useful preventive measures and programs, in order to minimize the injury rate in each sport in the future [Inklaar, 1994].

The aim of the current study is to record the incidence rate and the severity of injuries in beach handball and to correlate these injuries with the risk factors of this sport.

## MATERIALS AND METHODS

The study was conducted on 122 beach handball players (72 female and 50 male), that participated in the finals of the 2014 European Beach Tour (EBT), which took place from 30<sup>th</sup> May till 1<sup>st</sup> June in Thessaloniki, Greece. Participants were informed about the details of the study from the European Beach Handball Committee, during the technical meeting of the tournament.

A self-reported anonymous questionnaire was developed after an extensive review of the literature. The questionnaire included information on demographics of the athletes, such as age, weight, height and their history of athletic activity and participation. There were questions concerning the use of prophylactic equipment and technical training, as part of the everyday training session. The questionnaire also included inquiries on injuries that the players had sustained during the last 24 months. An injury was defined as an accident sustained during practice or competition, which led to a medical problem (e.g., pain, disability) and prevented participation (training or playing) for at least one day beyond the date of occurrence [Hatzimanouil *et al.*, 2008]. Information on the incidence rate, severity, localization, type and mechanism of injury, whether it occurred during training or during a game were also recorded.

The questionnaires were completed by each player separately during the visit made by the researchers at the place where the finals took place. Participation in the study was voluntary. Overall 122 athletes out of a total of 200 that participated in the tournament responded (61.1% participation rate). The researchers were present to answer any questions posed by the athletes.

Statistical analysis of the data included calculation of the mean and the frequency of each variable. The relationship between the incidence and severity of an injury with any other variables were studied with the chi-square test. In the cases where the relationships between two ordinal variables were examined, Kendall's tau-b test was used. The level of significance was determined at 0.05. The statistical package used was SPSS 21 (IBM, USA).

## RESULTS

Table 1 shows the demographic data of the participants in the study, regarding age, height, weight, body mass index (BMI), and years of training.

Table 1. Demographic information of study population

PARAMETER	MALE (n=50)	FEMALE (n=72)
AGE (years)	29.56 ±5.19	25.87 ±5.95
HEIGHT (cm)	185 ±17.28	170.9 ±6.3
WEIGHT (kg)	87.43 ±16.19	65.1 ±6.73
BMI	25.24±2.37	22.25±2.01
TRAINING AGE (years)	9.48 ±4.98	4.91 ±3.23

Table 2 includes information for both genders on the prophylactic use of equipment, and technique exercises, the injury incidence rate, and treatment. In total 34 of the 50 men athletes reported a total of 52 injuries and 45 of the 72 of female athletes reported a total of 50 injuries during the last 24 months. The injury incidence rate for male beach handball athletes in our results was 12 / 1000 hours during games, and 1.8/ 1000 hours of training. The injury rate for female athletes was 11.36/ 1000 hours during games, and 4 / 1000 hours of training. Injuries occurred more frequent during games both for male (77.3% of injuries) and for female athletes (59.5% of injuries).

Table 2. Prophylaxis and characteristics of injuries

PARAMETER	MALE (%)	FEMALE (%)	p-value
USE OF PROPHYLACTIC EQUIPMENT	20	34.7	0.1
TECHNICAL TRAINING	80	97.2	0.003
INCIDENCE OF INJURIES	68	62.5	0.57
PAST INJURIES (>24 MONTHS) ON THE SAME SITE AS THE ONE REPORTED ON THIS SURVEY	13.2	13.6	1
MORE THAN ONE INJURY	32.4	11.1	0.026
INJURY DURING GAME	77.3	59.5	0.08
TREATMENT (CONSERVATIVE)	73.9	85.2	0.17

The most common type of injury was muscle strains for both male and female players (Table 3).

Table 3. Type of injuries

TYPE OF INJURY	MALE (%)	FEMALE (%)	p-value
SPRAIN	9.1	2.7	0.12
MUSCLE CONTUSION	13.6	10.8	0.78
MUSCLE STRAIN	22.7	29.7	0.41
FRACTURE	9.1	18.9	0.21
SUBLUXATION	9.1	2.8	0.12
DISLOCATION	4.5	5.4	1
ACL INJURY	12.7	15	0.79
MENISCUS INJURY	10	3.9	0.12
OTHER	9.2	10.8	1

The majority of injuries affected the lower limbs (Table 4). More specifically, in male players the knee, the calf and the sole were the body parts more commonly injured whereas the knee and the shoulder were the regions more commonly affected by injuries in female players.

Table 4. Site of injury

BODY PART INJURED	MALE (%)	FEMALE (%)
<u>UPPER LIMB</u>	23.8	37.5
SHOULDER	10.5	19.4
ARM	-	8.3
ELBOW	5.3	8.3
WRIST	5.3	-
FINGER	-	5.6
<u>TORSO</u>	19	5
HEAD	5.2	2.8
NECK	5.3	-
<u>LOWER LIMB</u>	57.2	57.5
THIGH	5.3	-
KNEE	15.8	27.8
CALF	15.8	5.6
ANKLE	10.5	5.5
ACHILLES TENDON	-	5.5
SOLE	15.8	5.6
TOE	5.2	2.8

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).

Table 5a. Rate of contact and non-contact injuries

MECHANISM OF INJURY	MALE (%)	FEMALE (%)	p-value
CONTACT	56.3	69	0.07
NON CONTACT	43.8	31	

Table 5b. Injuries based on mechanism of injury

MECHANISM OF INJURY	MALE (%)	FEMALE (%)	p-value
COLLISION WITH OPPONENT	36.8	43.2	0.43
COLLISION WITH TEAMMATE	5.3	8.2	0.64
COLLISION WITH OBJECT	5.3	2.7	1
WITH THE BALL	15.8	13.5	0.73
ALONE WITHOUT BALL	21.1	10.8	0.5
OTHER	15.7	21.6	1

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. 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.

Table 6. Severity of injury

SEVERITY OF INJURY (ABSENCE FROM TRAINING IN WEEKS)	MALE (%)	FEMALE (%)	p-value
SMALL (0-1)	17.2	37.5	0.14
MODERATE (1-2)	44.8	27.1	0.29
SERIOUS (2-4)	20.7	27.1	0.55
VERY SERIOUS (>4)	17.2	8.3	0.46

## DISCUSSION

Beach handball is a “sand sport” gaining popularity lately. A special characteristic of all sand sports is the environment in which the games take place: Sand, high temperatures and many matches during the same day must be taken into account. Therefore, the incidence of injuries in these sports can be attributed to a combination of uneven and unstable ground, cold muscles, dehydration and fatigue due to overexposure, overtraining or improper training, especially when all these are combined with poor beach handball skills [Garcia and Bebetos, 2014].

All these factors can differentiate the injury rate in the specific sport compared to its “indoor” version, but there is a lack of scientific data regarding this issue. For this reason we conducted a study on 122 elite beach handball players (72 female and 50 male), that participated in the finals of the 2014 European Beach Tour (EBT), using a self-reported questionnaire, in order to identify the incidence and characteristics of injuries in beach handball.

The use of protective equipment has been suggested as a mean to avoid injuries, as it has been shown that lack of protective equipment in team handball female players leads to increase of injuries [Rasuli *et al.*, 2012]. Our study revealed that beach handball players use prophylactic equipment less commonly than players in team handball. In a relevant study in team handball players, 38.9% reported the use of such equipment [Hatzimanouil *et al.*, 2008], while only 20.8% of male and 35.2% of female of beach handball players in the present study use them (Table 2). This, however, was not found to be a risk factor for injuries neither for male nor for female athletes.

Another factor influencing the rate of injuries is technique. Henke *et al.* have shown that athletes with limited techniques will be at greater risk for acute and chronic injuries in team handball [Henke *et al.*, 2014]. This seems to have been incorporated in the training of beach handball, as most players in our study – especially women - reported the use of special technique training during practice (Table 2).

The incidence rate of injuries in beach handball games (males: 12/ 1000 hours – females: 11.36/ 1000 hours) is similar to those reported in team handball (males: 8.3 – 12.1/1000h [Olsen *et al.* 2006, Zantop and Petersen, 2003] – females: 10.4/ 1000h [Olsen *et al.* 2006]. The same applies to injuries during training. Male athletes reported an injury incidence rate of 1.8/ 1000 hours of training in beach handball, compared to 0.6/ 1000 training hours of team handball [Olsen *et al.* 2006, Olsen *et al.* 2004], while for female athletes the respective injury rate is 4/ 1000 hours of training in beach handball, and 3.4/ 1000 training hours of team handball [Wedderkopp *et al.*, 1997, Wedderkopp *et al.*, 1999]. Overall, injuries are far more common during games than training both in team and in beach handball for both genders. In male athletes injuries during training are more common in beach handball compared to team handball. Female athletes, on the other hand, are more prone to injuries during training both in beach and team handball compared to male athletes.

Compared to beach volley, beach handball demonstrates greater incidence rate during both competition and training. In beach volley the reported incidence rate of injuries is 3.1/1000 competition hours, and 0.8/1000 training hours [Bahr and Reeser, 2003]. In indoor volleyball the injury incidence is similar to beach volleyball, with a reported rate of 4-4.5 injuries/1000 competition hours, and 1.5-1.8 injuries/1000 training hours [Bahr and Bahr, 1997, Verhagen *et al.*, 2004]. It seems that the injury rate is characteristic of the specific sport, whether indoor or “sand”. “Sand” sports are not characterized as a whole by greater injury rates compared to indoor sports.

In team handball data and recent research state that previous injuries increase the risk for recurring injuries, in particular with regard to injuries of the lower extremities [Myklebust *et al.*, 2003, Myklebust *et al.*, 2013, Moller *et al.* 2012]. The findings of the present study however (Table 2), showed that only 13.2% of male athletes and 13.6% of female athletes had a recurrence to an older injury.

Another interesting finding of the study was that male athletes were more prone to multiple injuries, as 32.4% of them reported more than one injury during the last 24 months, compared to 11.1% of female athletes ( $p=0.026$ ) (Table 2).

Muscle strains are the most common type of injury, both in beach handball (Table 3), and in team handball [Olsen *et al.* 2004, Wedderkopp *et al.*, 1997, Olsen *et al.* 2003], with the lower limbs being the most common site of injury in both sports [Henke *et al.*, 2012, Wedderkopp *et al.*, 1997, Wedderkopp *et al.*, 1999, Moller *et al.*, 2012, Petersen *et al.*, 2002] (Table 4). The knee, the calf and the sole are the body parts more commonly injured in male players whereas knee and shoulder injuries constitute almost half of all injuries in female players (Table 4).

Injuries most commonly occur in contact situations in beach handball (Table 5a), and the same is true for team handball as well [Henke *et al.*, 2012]. There was a trend for female athletes to be more commonly involved in contact injuries (69% of injuries) compared to male (56.3%), although the difference was not statistically significant ( $p=0.07$ ). Collision with an opponent is the most common mechanism of injury for both genders (Table 5b).

The severity of injuries is determined by the time of absence from training they cause. Table 6 shows that 37.5% of injuries in female beach handball players resulted in less than 1 week absence from training, while 62% of male and 64.5% of female athletes returned to training within 2 weeks from injury.

Statistical analysis could not identify any statistical significance difference between variables, such as use of prophylactic equipment, technical training, gender, age, past injury or mechanism of injury and the incidence or severity of injuries. In male athletes there was a trend of association between the presence of a past injury at the same site and the severity of injuries, although the value did not reach statistical significance difference ( $p=0.082$ ). The low number of total injuries in the present study could have played a role in the fact that no variable could be associated with the incidence or severity of injuries. Larger studies are needed in order to clarify which factors influence the incidence and severity of injuries in beach handball.

Apart from its small sample size, this study has further limitations. It is based on a self-reported anonymous questionnaire. Therefore, an issue can be raised regarding its reliability. It is possible that the contradictory results which are frequently found in the literature regarding sport injuries, stems from tools of low reliability [Salman, 2014]. The study was conducted on elite athletes. Some of the findings might not apply to different subgroups, such as recreational beach handball athletes. The results of the present study should be viewed while taking into account the above considerations.

## CONCLUSION

Beach handball generally presents a moderate incidence rate and severity of injury occurrence, which is similar to that of indoor handball. Injuries mainly affect the lower limbs and specifically the knee. The most common mechanism of these injuries is contact with the opponent player. More studies are necessary to



provide information and data to aid in developing appropriate injury patterns and strategies for preventing injuries in beach handball.

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