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Various Aspects of the Scientific Development of Beach Handball over Three Decades - from “Keep It Simple” to the Olympic Games

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Abstract

The study aims to present the analyses of the scientific and historical development of beach handball over three-decades. The purpose is to identify future development trends through a broad analysis. The primary methods used were description, comparison and constructive analysis. The available scientific publications were analysed, and the quantitative and qualitative analyses using the deductive method is present. To 2019, the literature on beach handball in Europe consisted of three doctoral theses (all written in Spain), 81 quantitative analyses, a wide range of promotional material to an extensive amount of video (teaching and promotional) material. The changes in philosophy were also analysed. In the first articles, the philosophy revolved around “fair play”, “keep it simple”, and “sport for the future”, with a focus on “simple structure”, “very few restrictions”, “little administration”, “easy rules”, “a lot of sun and fun”, and “beach lifestyle”, while the more recent studies adopted a systematic approach, in many cases using high-tech measurement technology and the most modern approaches (performance analysis, time-motion analysis, Global Positioning System (GPS), load intensity, elite, technology, rotator cuff, peak torque, etc.) Based on this overview and according to ongoing rapid and dynamic developments, it is safe to predict further intensive development, as well as the possibility of it becoming an Olympic sport.

Keywords: beach handball, analyses, development, philosophy, scientific approach

Introduction

Although beach handball has experienced rapid growth and increasing interest over the previous two decades, it is still considered a “sport of the future.” Among the specific beach handball rules, which were created for the game to be more dramatic than indoor handball, there double points for goals scored in-flight, spin (360-degree) shots, and the goalkeeper’s scoring. Beach handball is played with four players per side, one of whom is the goalkeeper, on a 27-metre long and 12-metre wide sandy rectangular court. The match consists of two 10-minute sets with a shoot-out to determine the winning team in case of a tie. Beach handball is therefore characterized by a combination of high-intensity efforts, such as sudden accelerations with short recoveries, heterogeneously distributed

across a match. As a result, players are exposed to both high- and low-level work rates which demand appropriate speed, sprint ability, strength, and power (Cobos, 2011).

As mentioned by several authors (Hatzimanouil et al., 2017; Póvoas et al., 2012; Bon, Kuburović, & Šibila, 2018), for a many years beach handball was the sport without appropriate high-level scientific data and studies; and this has changed with intensive scientific researches, with modern methodologies in the recent years. Similar to handball, beach handball has been studied through notational analyses (Gruić, Vuleta, Bazzo, & Ohnjec, 2011; Morillo-Baro, Reigal, & Hernández-Mendo, 2015; Zapardiel, 2017a) and psychology (Morillo Baro, Reigal Garrido, & Hernández-Mendo, 2016; Zapardiel, 2017b) and in recent years also from playing positions per-



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spective (Zapardil & Asin- Izquierdo, 2020). We are also following intensive development in some other areas of beach handball, possibly psychological and sociological aspect, public relations and similar.

This study aims to present some characteristics of beach handball; to analyse all available scientific and expert literature, to generalize all scientific data, and predict the further development of beach handball.

Methods

The primary methods used were description and comparison. Constructive analyses were used; the available scientific publications in Europe and the quantitative and qualitative analyses that were completed within the frame of the EHF using the deductive methods were analysed. Keywords from the analysed articles were coded and generalized. Some of the data in the study were based on the author's personal observations and practical experiences (from the positions of a player and a national team coach).

Results and discussion

This chapter presents aspects of professional, scientific, and historical elements of beach handball in general, as well as some particular features of the game. We analysed the available scientific and professional articles and other publications, with a focus on more complex contributions including the theses that represent specific milestones in the development of beach handball.

The Historical Overview

The first records of beach handball date back three decades. Some earlier, amateur attempts at playing handball on the beach are known, but the first organized competitions were acknowledged in the early 1990s. The detailed and most complete set of rules and features of the game are presented in the book published by the International Handball Federation (IHF): Beach handball from A to Z (Bebetsos, 2012).

Beach handball began as a discipline targeted towards tourists, as a leisurely, fun sport, but has now a clear structure and regulations. The natural conditions (sand beaches) have had a significant influence. The first official international beach handball competition was organized by Buttarelli in Rome in 1993 (Van Linder, Gehrler, & Trespidi, 2004; Zapardiel, 2017a). The first national team tournament was held in 1995 and the first National Championship in 1997, both in Spain. The first European Championship was organized in 2000 (and then each second year).

A strategic change in the structure of the game occurred in 2002 in Cádiz, Spain (the second European beach handball Championship). That was the first championship in which the spin-shot, in addition to the in-flight, also won two points (Zapardiel, 2018).

At the third European championship in Alanya (Turkey), the importance of the shoot-out was highlighted since 25% of the matches ended with this tie-break system (Zapardiel, 2018). Another aspect highlighted in another subsequent analysis (Van Linder et al, 2004) was that the teams' performance improvement was based more on individual technical improvement than on the improvement of common tactics (Zapardiel, 2018). The fourth European Championship took place in Cuxhaven (Germany) in 2006; the fifth was played in Misano Adriatico (Italy) in 2007 (Gehrler & Trespidi, 2007);

then in Larvik (Norway) 2009, Umag (Croatia) 2011, Randers (Denmark) 2013 Lloret de Mar (Spain) 2015 and Zagreb (Croatia) 2017 (Zapardiel, 2018).

After the introduction of the official beach handball rules in 2002, the sport gained global popularity. After the first World Championship (as a part of the World Games) in 2005, there was a systematic improvement of the organization of competitions, which also included young age categories. Apart from national and international championships, beach handball leagues were established in many countries. The European Beach Handball Tour (EBT), a club competition has been organized since the 2009/10 season (Zapardiel, 2017a).

The Structure of Beach Handball; Physical Demands -Motion Analysis and Injuries

One of the latest studies (Navarro, Morillo, Reigal, & Hernández-Mendo, 2018) was conducted to identify the relationships between the various behaviours of the positional attack. The data obtained were subjected to a polar coordinate analysis from the perspective of genuine retrospectivity. Related to how the attack ends and to the player who finishes it, seven focal behaviours were chosen. The results revealed differences by gender (Navarro et al., 2018).

Applying the median test for each variable referring to the victory/defeat criterion, a statistically significant difference between winning and defeated teams was found in the following variables: successful in-flight shots (INF-U), spin shots (SPS), blocking (BLO), and technical errors (TEC) (Gruić et al., 2011). The analyses of defence tactics in high-level teams were made by Greek researchers (Gkagkanas et al., 2018) with use of video- analyses.

The analysis of positional attack in male and female beach handball with polar coordinates (Morillo-Baro et al., 2015) aims to provide a new perspective on understanding and differentiation of play behaviour in the phase of the positional attack. The observation design used was nomothetic, monitoring, and multidimensional. The results showed differences in mating behaviour in the male and female categories (Morillo-Baro et al., 2015).

The analysis of time-motion and heart rate in elite male and female beach handball (Pueo, Jimenez-Olmedo, Penichet, Ortega, & Espina, 2017) concludes that beach handball is a high-intensity mixed-metabolism sport; with numerous moderate-to-high intensity displacements, distributed intermittently throughout the game: long periods of low-intensity activity interspersed by short bursts of high intensity (Pueo et al., 2017).

It was also defined (Cobos, 2011) as a vigorous activity and $26.1 \pm 26.5\%$ as very vigorous, while during the second half the percentage of moderate activity was reduced, as the percentage of very vigorous activity increased to $40.8 \pm 25.5\%$. The results suggest that the practice is a vigorous and very vigorous activity during 70% of the total activity time. Heart rates were maintained between 150 and 157 bpm, representing the 80–83% reference HRmax (Cobos, 2011).

The aim of the study (Zapardiel, 2018) was to analyse the differences in the behaviour of the rotator muscles in the shoulder joint complex and athletes in non-ball throwing disciplines (ANTD). Using a System 3 Biodex isokinetic dynamometer, the researchers found significant differences ($p > 0.01$) between the two study groups (26 male BHP and 70 male ANTD) in the sub-variable time-to-peak torque-internal

rotation at 180°/s. BHP takes less time than ANTD to reach the peak torque at high speeds on the internal rotation of the dominant arm (Zapardiel, 2018). In a previous study, Zapardiel (2014) also reports a strength evaluation of the shoulder joint rotator muscles through isokinetic dynamometry.

Among the results obtained, points out that while higher strength values were found in beach handball players' shoulder joint internal rotator muscles, along with the presence of an agonist/antagonist muscle imbalance in the shoulder joint rotator muscles, there is less correlation between the isokinetic variables of the shoulder joint rotator muscles in beach handball players and specific anthropometric measures, compared to the other groups (non-throwing athletes) under study.

As is typical in handball, also in beach handball, we followed increase amount of injuries studies and the study of Achenbach et al. (2018) investigate the injury pattern and conclude that, in general, beach handball seems to have a lower incidence of time-loss injuries than that reported for indoor team handball. (Achenbach et al., 2018). The aim of one of the latest studies (Hotzaminouil et al., 2017) showed that injuries in beach handball are similar to those of team handball, rather than other "sand" sports (Hotzaminouil et al., 2017).

Sports Psychological Profile; Recreation

The subject of the sports psychological research was to examine the relationship between the sports psychological profile and competitive anxiety in a group of beach handball players (Morillo et al., 2015) and also relationships between autonomy support and perception motivational climate with the sport psychological profile in beach handball (Zapardiel, 2016b). The Psychological Inventory of Sports Performance (IPED) and the State Anxiety Inventory in Competition-2 (CSAI-2) were used to evaluate the state of anxiety and self-confidence. The correlation of the analysis and linear regression revealed significant relations between the studied construct. The negative coping control sample and the motivational level were the best predictors of anxiety, and the control of negative and positive coping were the most important predictors of confidence. Some difference existed by gender in all models (Morillo et al., 2015). Further research in the field of sports psychology and sociology would be needed and would probably answer such and similar questions.

There are some other aspects -outdoor sports are a risk activity for skin cancer, especially if adequate sun protection measures are not used. Beach handball players are highly exposed to the effects of ultraviolet radiation and often take insufficient measures of sun protection (De Castro-Maqueda et al, 2019).

A pilot study (Bělka, Hůlka, Šafář, Weisser and Chadimova, 2015) was prepared to investigate beach handball (and beach

volleyball) as a means of encouraging people to increase their physical activity and increase the possibility of (beach) handball on the recreational level. It is important to involve beach handball in curriculum of physical education hours in elementary and high school (Zapardiel, Serrano, 2016) one one hand, and on other - to continue with studies with high- level methodology (e.g. Vázquez-Diz, Morillo-Baro, Reigal, Morales-Sánchez, & Hernández-Mendo, 2019) and with several modern technologies (e.g. Zapardiel & Asín-Izquierdo, 2020).

Conclusions

From the contributions in the first decade of beach handball research (Van Linder et al., 2004; Gehrler, & Trespidi, 2007; etc.), it is evident that at the beginning the vision of beach handball was directed towards "sport for recreation and fun", "sport for tourism", "summer sport (only)", and similar. According to studies in the previous decade, one of the aims was to predict the further development of beach handball. Constructive analysis was used to evaluate the state and further trends in development in sport society till really complex studies – e.-g. about contextual factors and decision-making in the behaviour of finalization in the positional attack in beach handball (Vázquez-Diz et al., 2019). Development means a different philosophy of the game and revolved around "keep it simple", "sport for the future", while the latest research studies adopted a systematic scientific approach. In the first articles, the philosophy of the game revolved around "fair play", "keep it simple", "sport for the future", while the latest research studies adopted a systematic approach in increasingly complex scientific studies. Keywords in the first decade were focused on "a simple structure", "very few restrictions", "little administration", "easy rules", "a lot of sun and fun" and "beach lifestyle"; whereas in the most recent decade common keywords included "performance analysis", "time-motion analysis", "Global Positioning System (GPS)", "load intensity", "elite", "technology", "rotator cuff", "peak torque" among others. From the above-mentioned studies, it is evident that beach handball has been scientifically observed from different points of view and while those studies are part of ongoing research, there are still many areas that have not been examined (e.g., beach handball and sociology, the theory of sports training, management, media presence, PR, pedagogical aspects, special methodology, strategical planning etc.).

Summarizing our analyses, we can conclude that beach handball is becoming a modern, fully structured sport discipline; with a defined structure, with clear philosophy; and it seems that beach handball is maybe to becoming in-dependent sport discipline - not being part of handball in the future), if its efforts to become an Olympic discipline are any indication.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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