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HOW MUCH DOES A WATER POLO PLAYER SWIM DURING A GAME?

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ABSTRACT. It has always been a curiosity about how much athletes run, skate or swim in various team sports. Beside many variables, the different environment of the field of play will determine the speed and distance on how fast and how far an athlete moves during a game. The purpose of this study is to ascertain the distance a water polo player swims during one game. We have used two distinctive methods in our research according to whether the game was played in an indoor or an outdoor pool. Recognizing more accurately the distances swum by players during a water polo game it could be useful to improve planning of training and to evaluate the players' performances in different competitions.

Keywords**:** *swimming, water polo, tracking distance, team sport, performance.*

REZUMAT. ***Cât de mult înoată un jucător de polo în timpul unui meci?*** Întotdeauna a existat o curiozitate cu privire la ce distanță aleargă, patinează sau înoată sportivii în diferite sporturi de echipă. Pe lângă multe variabile, mediul diferit al terenurilor de joc va determina viteza și distanța la cât de repede și cât de departe se deplasează un jucător în timpul unui meci. Scopul acestui studiu este de a constata distanța care un jucător de polo pe apă înoată în timpul unui meci. În cercetarea noastră am folosit două metode distincte în funcție de locul în care s-a desfășurat jocul, bazin de înot acoperit sau în aer liber. Cunoașterea mai precisă a distanțelor înotate de jucători în timpul unui meci de polo pe apă ar putea fi utilă pentru îmbunătățirea planificării proceselor de antrenament și de a evalua performanțele jucătorilor în diferite competiții.

Cuvinte-cheie**:** *înot, polo pe apă, trasare distanță, sport de echipă, performanță.*

Introduction

It has been always a curiosity about how much athletes run, skate or swim in different team sports. Beside many variables, the different environment of the field of play will determine the speed and distance on how fast and how far an athlete moves during a game. On how far on the field, it is limited by the rules of the game, but what we are interested here is the total distance athletes cover

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during one game. According to Fox (2016), in NBA basketball a player runs 2.0 to 4.3 km per game, a football (soccer) player runs 11km per game in average while rugby players run about 7 km in a game. In the study "Covered distances of handball players obtained by an automatic tracking method" by Russomanno et al. (2007), concluded that a team handball player runs 4.4 to 5 km per game.

An ice hockey player over the course of a game skates approximately 8 km, according to Fit for Hockey (2016) retrieved from (http://www.cybexintl.com/solutions/sports/nhl_fit.aspx).

In a different environment, in water polo "film analyses of a complete game show that the total linear distance traveled by an active player who plays most of the game, in a 30-meter course and 8-minute quarters, ranges from a distance of 1500 meters and up to a maximum of 1800 meters (Dettamanti, 2010)". Right now, players have only 30 seconds to swim down the pool, set up the offense and score. They will spend approximately 15-20 seconds getting down to the other end of the pool depending on the age and level of play and then they are left with 10-15 seconds to organize the offense. In basketball, players run the similar distance (compared to the water polo court) which leaves them with 25 seconds to set up the offense (Ivovic, 2012).

Objective

The purpose of this study is to ascertain the distance a water polo player swims during a game. In our research we are monitoring players' horizontal movements in the water that are identic to the four known swimming strokes and derivatives of these, the specific horizontal movements used in the game of water polo. Consequently, by realizing more accurately the distances swum during a water polo game it is beneficial for the players training process and game evaluation.

Materials and Methods

We have used two different methods in our research according to whether the game was played in an indoor or outdoor pool. Furthermore, positions of players were taking in consideration according to Water Polo Positions (2016), retrieved from (http://waterpolo.isport.com/water-polo-guides/water-polo-positions). Detecting player's movement in games that were played in an indoor pool we have used a video observation tracking system, while tracking on games in an outdoor pool we have utilized a Garmin 920 XT GPS system. During our research we tried to cover the distances swum by players on each position, including all substitutions occurred. Also, we registered games played only on 30 meter fields and concluded with no overtime. Warm up swimming and movements between quarters weren't logged.

Preceding our measurements we estimated a hypothetic distance covered only by swimming by field players during a game on each position as following:

- Left Wing: from 2 m defense to 3 m offense or from 2 m defense to 6m offense;
- Left Flat: from 5 m defense to 6m offense or from 5 m defense to 3 m offense;
- Hole Set: from 7 m defense to 3 m offense;
- Point: from 2 m defense to 8 m offense;
- Right Wing: from 2m defense to 3 m offense or from 2m defense to 6m offense;
- Right Flat: from 5 m defense to 6 m offense or from 5m defense to 3m offense.

On both wing players and flat (driver) players we considered movements effectuated not only from wing to wing or flat to flat position on same side of the field but also swimming from wing to flat or flat to wing position on defense and offense. Except occasional drives from wing to hole set position or point to wing positions in general points and hole sets movements were estimated between 2m defense to 8m offense and 7m defense to 3m offense. Therefore, during a one transition period offense to defense or defense to offense we estimated an average distance of swimming of 23.5 meters for the left/right wing, 20.5 meters for the left/right flat, 20 meters for the point, 20 meters for the hole set. In a 4 period 8 minutes game on 30 seconds offensive actual play time we computed a total of swimming of 1504 meters for left/right wings, 1312 meters for flats, 1280 meters for hole sets and points (Table 1). Referring in general we can estimate a total of 1344 meters swimming by a player during a water polo game.

Table 1. Hypothetical measurements of distance swum during one game by water polo players on different positions

Position of Player	**Distance swum during one transition (meters)**	**Distance swum during one quarter (meters)**	**Distance swum during one game (meters)**
Left/Right Wing	23.5	376	1504
Left/Right Flat	20.5	328	1312
Hole Set	20	320	1280
Point	20	320	1280

However, work-rest ratios in a vertical position are higher for points and hole sets and swimming distances are shorter in these positions compared to wings and flats, it is important to mention how much a player stays in a vertical

or horizontal position during a water polo game. “Calculations from time and motion analyses indicate that field players spend only 45% to 55% of actual game time in a horizontal body position. The remainder of the time is spent performing activities in predominantly vertical body positions, with and without contact with an opponent, and at low to moderate intensity” (Dettamanti, 2010). The International Swimming Federation (FINA) already started testing new rules by reducing the field of play from 30 meters to 25 meters in order to make the game more dynamic, less physical and with less swimming in transition.

In our research we have covered swimming distances in 18 indoor and 12 outdoor water polo games played on 30 meter fields with the duration of four times eight minute quarters.

Results

Tracking on games in an outdoor pool we have utilized a Garmin 920 XT GPS system. During game, each time the tracking device goes under the water it loses GPS signal. For a better accuracy we asked players to place the device under a swim cap then cover with the water polo cap to measure distance, stroke and speed during a game. Therefore, in average a left/right wing swum 1472 meters (Figures 1 and 2), a left/right flat swum 1287 meters, a point covered 988 meters, a hole set accumulated 933 meters of swimming.

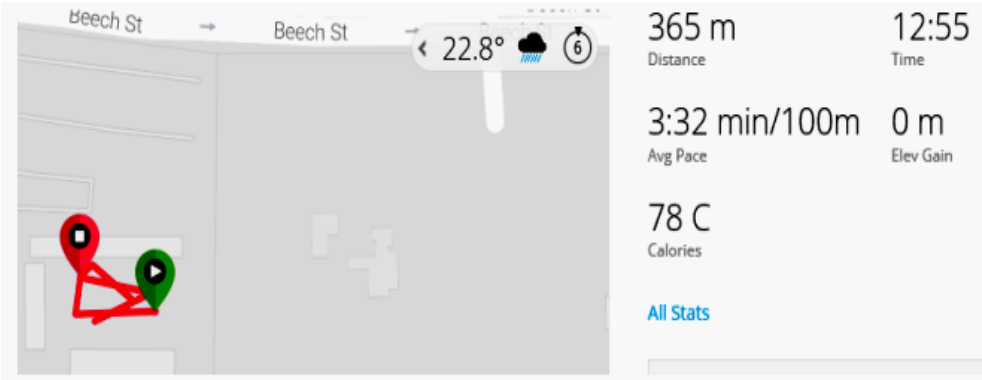

Figure 1. Distance covered in swimming by Left Wing during one quarter of an outdoor water polo game

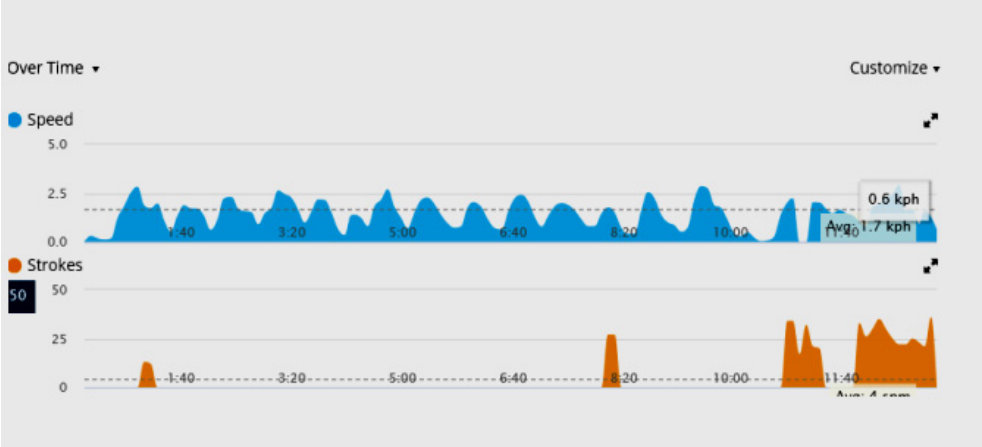

Figure 2. Speed and strokes covered by Left Wing during one quarter of an outdoor water polo game

Detecting distances swum in games that were played in an indoor pool we have used a video observation tracking system. The coding and video editing enabled us to deliver customized analysis and streamlined performance feedback. As a result, during one game the average swimming part on different positions were, 1491 meters on left/right wing, 1315 meters on left/right flat, 1011 meters on point and 949 meters on hole set position. The total average horizontal movements during one indoor water polo game resulted in 1191 meters of swimming (Table 2).

Table 2. Distances a water polo player swims during a game according to different tracking systems

	Left/Right Wing distance swum (meters)	Left/Right Flat distance swum (meters)	Point distance swum (meters)	Hole Set distance swum (meters)	Average a player swum (meters)
GPS tracking outdoor games	1472	1287	988	933	1170
Video tracking indoor games	1491	1315	1011	949	1191
Average	1481	1301	999	941	1180
Estimated distances	1504	1312	1280	1280	1344

Conclusions

Observing more accurately the distance covered by water polo players during a game can be used to improve planning in athletes training process. Our research concluded that the distance swum during a water polo game is shorter than swimming distance coaches consider players are covering during a game (Table 2.). Therefore, instead of large volume swimming practices based mostly on freestyle, it is indicated to focus more on water polo specific horizontal body position swimming as well as vertical body position drills during training processes.

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