BWF SPORTS SCIENCE RESEARCH PROJECTS 2017-2018

FINAL REPORT

CHARACTERIZATION OF WHEELCHAIR PARA-BADMINTON GAMES

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Introduction

Considering Sports Pedagogy as the area of Sports Sciences that investigates the stages of organization, systematization, application and evaluation of pedagogical procedures in moments of initiation, experience, learning and sports training (GALATTI et al., 2015), the present project considers the phenomenon of adapted sport for people with disabilities (PD) emphasizing the importance of actions that involve, according to Paes (2002) an inclusion pedagogy. According to Freire (2000, p. 94), sport should be understood as "a human rights that should be extended to all citizens, not to a small group of privileged people".

The sport in question, approached from the focus of Sports Pedagogy, is the Badminton for PD. Badminton had its first rules published in 1877 and today is played by millions of players in five continents in the world. In some Asian and European countries is the most popular sport (CHINT et al., 1995; FERNANDES, 2008), and has became popular in other countries after its official insertion in the 1992 Olympic Games of Barcelona.

In its adapted version, Badminton for PD or Para-Badminton (PBd) is a sport that is growing popularity in the world, including in Brazil. It was officially recognized in 1996 by the International Badminton Association for Disabled (IBAD, 2009), former PBd World Federation (PBWF), which provides sport as: rehabilitation, leisure, recreation or competition for people with physical disabilities. It was only in June 2011 that the PBWF was integrated into the Badminton World Federation (BWF) (MYO-JUNG; MYUNG-WON, 2012), which now governs both forms of Badminton.

In Brazil, the PBd with official rules began its development in 2006 through the initiative of the Physical Education teacher Létisson Samarone Pereira, in Brasília – DF and since 2009 the country is affiliated to PBWF / BWF (STRAPASSON, 2016). Currently,the National Ranking organized by Brazilian Badminton Confederation (CBBd), which takes into account the competitions held in the last 24 months, there are 80 para-athletes, from which only 17.5% are female.

It is known that the reality of PBd in Brazil is still far from ideal and this can be related to: lack of supply of qualified personnel to training, teaching, rehabilitation, educate and provide leisure and competitive activities designed to PBd; the reduced number of players; the lack of specialized professionals and specific programs; insufficient public facilities associated with the absence of Badminton discipline in most Brazilian universities; among other factors that hinder the dissemination of sport in the country.

Considering the described context above, information is fundamental to change this reality.

According to BWF (2013a), the basic rules of PBd present adaptations concerning the sports categories, the playing court and the additional equipment. Regarding the sport categories, the players are classified according to disability; the game court, has size reduction in three categories; wheelchair, crutches and prostheses are the additional equipment specifically designed for the sport practice (BWF, 2013a). In PBd there are six sports classes, with two categories for wheelchair users (WU) divided into WH1 and WH2 and the other non-WU classes, divided into SL3, SL4, SU5 and SS6 (BWF, 2012), as shown in Table 1.

Table 1: Sport Classes, Main Characteristics and Eligible Physical Disability in PBd

<table>
<tr><th colspan="4">Sport Classes and Main Characteristics</th><th>Eligible Physical Disability in PBd</th></tr>
<tr><td>Wheelchair Sport Classes[1]</td><td>WU</td><td>WH1
WH2</td><td>Need to reduce the size of the court and use a wheelchair (Figures 1 and 2).</td><td rowspan="4">Spinal cord injury, Poliomyelitis, Spina bifida, Cerebral palsy, Muscular dystrophy, Amputation, Cerebrovascular accident, Brachial plexus injury, Malformation of limbs, Short stature or dwarfism, among others.</td></tr>
<tr><td rowspan="2">Standing Sport Classes[2]</td><td rowspan="3">Non WU</td><td>SL3</td><td>Need to reduce the size of the court (half a court).</td></tr>
<tr><td rowspan="2">SL4
SU5
SS6</td><td rowspan="2">There is no reduction the size of the court.</td></tr>
<tr><td>Short Stature Sport Class[3]</td></tr>
</table>

Key: BWF (2012), PETRINOVIC (2014).

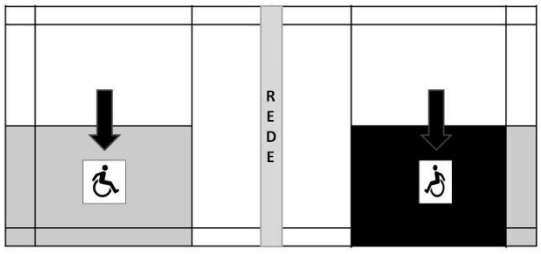

Figure 1: PBd Court for wheelchair users – single matches.
Gray area: play area; Black area: serve area.

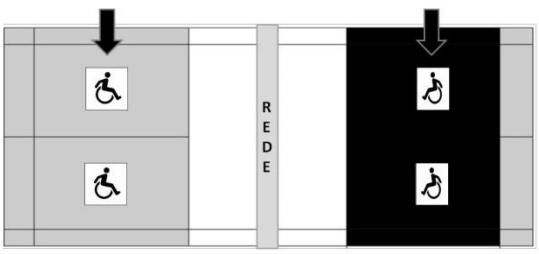

Figure 2: PBd Court for wheelchair users – double matches.
Gray area: play area; Black area: serve area.

Key: BWF (2013b), with illustrations by the author.

[1] Wheelchair Sport Classes: Sport Classes for Wheelchair Users (WH1 e WH2).
[2] Standing Sport Classes: Sport Classes for non Wheelchair Users (SL3, SL4 e SU5).
[3] Short Stature Sport Class: Sport Classes for people with Short Stature (SS6).

The matches, in both conventional and adapted versions, are played in the best of three games and the first player to reach 21 points wins the game. The sport offers the categories: male single (MS), female single (FS), male double (MD), female double (FD) and double mixed (DM) (COB, 2011).

The Badminton game can be characterized by movement acyclic structure, short, intermittent, moderate and high-intensity efforts (MANRIQUE; PADY, 2002). It is also characterized by a multiplicity of actions both of lower limbs (not in the case of WU) and of upper limbs in a short period of time, which makes the game fast and physically exhausting (MANRIQUE, 2002; MANRIQUE; GONZALEZ-BILDILLO, 2003; FERNANDES, 2008). Therefore, players are forced to make fast decisions and are constantly under pressure (FERNANDES, 2008).

Manrique and collaborators (2004) consider the number of strikes (total work volume) applied in racket games as the first analysis factor of temporal sport structure The quantification of strikes performed in a Badminton game at a point, game or match, can provide useful information to establish parameters in prescription of volume, intensity and frequency in technical, physical and tactical training (FERNANDEZ-FERNANDEZ; RIVAS; VILLANUEVA, 2009). However, studies analyzing the time, space and action aspects were not found with PBd players.

To characterize the Badminton game, Macedo and Leite (2009) cite that the scout can be an effective tool. In addition, Manrique and collaborators (2004) complement that the scout allows the recognition of what needs to be improved in the game (weaknesses) and areas that require continued reinforcement (strengths), improving players' performance. Badminton coaches believe that scout involves a potentially fundamental component in improving players' technical and tactical performance, as well as the process of training evolution (BUTTERWORTH; TURNER; JOHNSTONE, 2012).

The “Characterization of Wheelchair Para-Badminton games” is an original and relevant study for all professionals acting with Badminton in its adapted version. PBd has a bright future and will make its Paralympic debut in Tokyo 2020 (IPC, 2014). However, the rise of its status, from "adapted" to "Paralympic", highlights a worrisome reality, in which there is a limitation in the number of world-wide publications relating to PBd. There are only 21[4] references between books, dissertations, theses and articles (STRAPASSON, 2016). It is

[4] 03 books (MYO-JUNG; MYUNG-WON, 2012; WILLIAMS, 2012; BWF, 2014/2015); 01 Guide (HAIACHI, 2013); 02 Master Thesis (KAIPAINEN, 2013; OLIVEIRA, 2016); 01 Doctoral Thesis (STRAPASSON, 2016); e, 14 Articles (STRAPASSON and co-authors, 2013, 2014a, 2014b, 2015a, 2015b, 2017; OLIVEIRA; FAUSTINO; SEABRA JÚNIOR, 2013; OLIVEIRA; SEABRA JÚNIOR, 2014; QUIRÓS; VILLANUEVA, [s.d.]; PETRINOVIC, 2015;

known that reduced samples from scientific data is a common feature of studies produced in the area of adapted sports, but in the case of PBd, the lack of data is significant. It should be noted that in 21 works (books, thesis and articles) cited, just one refer to the characteristics of the game and only 03 offer guidance on the teaching of PBd for people with physical disability.

This paper proposes to fill the gap relating to understanding the characteristics of "Para-Badminton on wheels", in order to direct and assist coaches to adjust the training intensity accordingly. Therefore, this study intends to characterize PBd game in its TIME-SPACE-ACTION aspects. The specific objectives are:

- Check the temporal aspects of PBd games in WH1 and WH2 categories with regard to match duration, duration of rallies and pause time;
- Analyze the spatial aspects of PBd games in WH1 and WH2 categories with respect of court places where the shuttle falls most;
- Quantify the strikes executed in PBd games in both categories;
- Check which were the strikes executed in each coup, as well as which strikes generated winners and/or forced and unforced errors;
- Check if there is a difference between the game of WH1 and WH2 categories and, if there is one, describe them.

Methods

A quantitative field survey was conducted according to observational and field descriptive research method (THOMAS; NELSON; SILVERMAN, 2012) in which a PBd game was characterized in TIME-SPACE-ACTION aspects.

This research was funded by Badminton World Federation (BWF), which authorized the researcher to record wheelchair matches at 11th PBd World Championships, from 21 to 26 November 2017 in Ulsan, South Korea. A World Championship was chosen due to a large number of WU athletes, from different countries of five Continents.

The matches were recorded using 03 camcorders (JVC® brand), the videos were analyzed using Windows Media Player® software and data transcribed into an ad hoc spreadsheet of Microsoft Excel® software 2016.

A single evaluator was responsible for recording the data, thus avoiding the variability of information and the adoption of different technical criteria. In relation to temporal and

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JANIACZYK, 2015; KATIRCI; YÜCE, 2016; OLIVEIRA; GONÇALVES; SEABRA JÚNIOR, 2017; YÜKSEL, 2018).

spatial aspects, the duration of rallies, the pause time and the amount of strikes per rally were verified, as well as the places on court, where the shuttle fell most frequently (winners).

Through the technical scout, the strikes were quantified by elements in gameplay: Service, Clear, Smash, Lob, Net-shot or Short, Drop and Drive. Amount of winners, forced errors (FE) and unforced errors (UE) resulting from technical actions.

The selection criteria of the games were: to be part of WH1 and WH2 categories, male single; in different stages of dispute, games in semifinal and final phases. The exclusion criteria were games with a large difference of points (2 x 0, 16 points of difference on each game) were excluded from the evaluation.

The analysis of temporal, spatial and technical aspects of PBd games is fundamental for understanding the dynamics of the game and can be useful to build a teaching program and/or training program as well as providing guidance to appropriate tactics during games.

Data Processing

To ensure reliability in observations, one of the games was randomly selected for observation and recording in two moments. The interval between observations was 10 days. The intraclass correlation coefficient (ICC) was used to test the reliability between observations of rally time, number of strikes in the shuttle and pause time. The ICC results indicated reliable values for game observation.

Descriptive statistics composed of mean value and standard deviation (SD), Median (1st and 3rd quartile), confidence interval (95% CI) and frequency distribution (absolute and relative) were used to summarize the data. Effect size (ES) and percent delta (Δ%) were calculated to indicate practical differences between variables. Kolmogorov-Smirnov test was used to analyze data normality. The Mann-Whitney test was used to compare rally time, number of strikes in the shuttle and the pause time between WH1 *vs.* WH2 classes. The comparison of strikes frequency between WH1 vs WH2 was performed using the chi-square test ($\chi 2$). We consider the value of $\alpha = 5\%$ to identify significant differences between classes.

Results and Discussion

The mean value and standard deviation of total playing time (TPT) of the game in WH1/WH2 categories are presented in Table 2. Similar results were found by Strapasson et al. (2017) during the finals of 9th PBd World Championships in Germany / 2013, where the total playing time of WH1 and WH2 categories was 1310s and 1834s, respectively.

Table 2. Total Playing Time

Variable	Classes	N (games)	Mean Value ± sd
Total Time (s)	WH1	10	1780.30 ± 573.05
	WH2	10	2012.30 ± 1098.03

Key: N = number of games; sd = standard deviation.

Table 3 presents the descriptive statistics of TIME-ACTION and ICC of rally time, number of strikes in the shuttle and pause time.

Table 3: Results regarding TIME-ACTION and Observations of Reliability

	Rally Time				Strikes in the Shuttle				Pause Time			
	A1G1	**A2G1**	**A1G2**	**A2G2**	**A1G1**	**A2G1**	**A1G2**	**A2G2**	**A1G1**	**A2G1**	**A1G2**	**A2G2**
Mean Value	7.54	7.49	6.82	6.81	5.70	5.70	5.22	5.22	19.02	19.02	13.32	13.28
sd	6.35	6.33	3.92	3.92	4.67	4.67	2.99	2.99	24.68	24.67	10.82	10.83
ES	0.01 (trifling)		0.00 (trifling)		0.00 (trifling)		0.00 (trifling)		0.00 (trifling)		0.00 (trifling)	
Δ%	-1%		0%		0%		0%		0%		0%	
1st quartile	2.79	2.84	2.85	2.93	2.00	2.00	3.00	3.00	10.28	10.21	8.77	8.87
Median	4.05	4.13	7.08	7.09	3.00	3.00	5.00	5.00	13.00	12.89	10.81	10.78
3rd quartile	12.49	12.43	10.90	10.80	9.00	9.00	8.00	8.00	15.74	15.69	11.68	11.68
Anova ICC	$F_{(26, 1)} = 5.33$ p = 0.029*		$F_{(26, 1)} = 0.166$ p = 0.687		Standard Difference Error = 0		Standard Difference Error = 0		$F_{(26, 1)} = 0.003$ p = 0.957		$F_{(25, 1)} = 2.328$ p = 0.140	
ICC	$ICC_{3,1} = 1.00$ p < 0.001*		$ICC_{3,1} = 1.00$ p < 0.001*		$ICC_{3,1} = 1.00$ p < 0.001*		$ICC_{3,1} = 1.00$ p < 0.001*		$ICC_{3,1} = 1.00$ p < 0.001*		$ICC_{3,1} = 1.00$ p < 0.001*	

Key: A1G1 = Assessment 1, game 1 / A2G1: Assessment 2, game 1 / A1G2 = Assessment 1, game 2 / A2G2 = Assessment 2, game 2 / sd = standard deviation / ES = effect size / Δ% = percent delta / ICC = Intraclass correlation coefficient / * p <0.05.

When performing the normality test (Table 4), the data did not present a normal distribution, indicating the need for non-parametric analysis.

Table 4: Kolmogorov-Smirnov Normality Tests of Investigated Variables

	Test Statistics	Gl	P
Rally Time (min.)	0.164	1287	< 0.001
Strikes in the Shuttle	0.177	1287	< 0.001
Pause time (min.)	0.249	1287	< 0.001

Key: gl = degrees of freedom; p = level of significance.

Table 5 presents the descriptive results of variables: rally time, number of strikes in the shuttle and pause time. There was a difference between the number of strikes in the shuttle and the pause time. These results indicate that WH2 class players perform more strikes in the shuttle and require shorter pause time than WH1 class players. It is pertinent to remember that WH1 players present more physical impairments than WH2

Table 5: Descriptive Results and Comparison between Classes WH1 vs WH2

	Rally Time (min.)		Strikes in the Shuttle		Pause Time (min.)	
	WH1	**WH2**	**WH1**	**WH2**	**WH1**	**WH2**
Mean Value ±sd	10.19±8.39	12.49±12.47	8±7	10±10	15.06±10.37	14.14±10.57
CI95%	9.52 a 10.85	11.58 a 13.41	8 a 9	9 a 11	14.22 a 15.89	13.35 a 14.92
1st quartile	4.34	4.36	4	4	10.34	9.07
Median	7.95	8.57	6	7	12.54	11.21
3rd quartile	13.17	16.04	10	13	15.7	14.18
ES; Δ%	0.2 (small); 23%		0.3 (small); 27%		0.1 (trifling); -6%	
Mann-Whitney Test	Z = -1.942; p = 0.05		Z = -3.064; p = 0.002*		Z = -5.835; p < 0.001*	

Key: IC95% = confidence interval / ES = effect size / Δ% = delta percentage / * difference (p <0.05) between WH1 vs WH2.

Strapasson et al. (2016) analyzed three WH1 games and three WH2, male single, at 10th PBd World Championship in England/2015 and found that the mean value duration of rally was 10.8 seconds (± 9.2); the mean number of strikes in the shuttle per rally was 9.9 times (± 8.6), and the pause time was 9.4 seconds (± 8.4).

The most frequent strikes performed by the players, shown in Table 6, were: Clear (n = 4617, 38.3%), Lob (n = 2333, 19.4%), Drop (n = 1839, 15.3%) and Net-shot (n = 1428, 11.8%), for both functional classes, characterizing the game in strikes that require a lot of displacement in court. Strapasson et al. (2016) demonstrated the same result sequence in their study (Clear, Lob, Drop and Net-shot). Williams (2012) and Strapasson et al. (2017) presented a different sequence of strikes most used during the matches, being Clear, Net-shot, Drop and Lob, respectively. For Williams (2012) Clear, Drop, Net-shot and Lob are the main strikes used in WU categories. In addition, they say that one of basic tactics is to move the opponent from the front to back of the court trying to open spaces in the court.

With these results, it is noticed that reported strikes are characteristic of wheelchair PBd, in which players intercalate shuttles in front and back of the court, force strikes in back or in front of the court with intention of unbalancing the opponent and force the error thereof (STRAPASSON et al., 2017).

In relation of Drive, there is little use of strike in both categories, although with a higher incidence in WH2 (Table 6). It should be remembered that Drive is one of the fastest strikes of Badminton (MANRIQUE, 2000; FONSECA, SILVA, 2012) and that, it was possibly more effected in this category due to the greater control and stability of players' trunk, as well as greater speed in displacements with the wheelchair. The studies of Strapasson et al. (2014, 2017) have also shown that Drive is a strike not frequently played in WU games, which can be explained by the trajectory and speed that characterizes the strike.

Regarding services, we can see in Table 6 variation of four forms, with a greater use of backhand (6.6%) compared to the forehand (4.3%) (Table 6).

Table 6: Absolute and Relative Frequency of Strikes Performed by Players

Strikes	WH1	WH2	Total
Clear	1982 (40,6%)	2635 (36,7%)	4617 (38,3%)
Drive	23 (0,5%)	79 (1,1%)	102 (0,8%)
Drop	737 (15,1%)	1102 (15,4%)	1839 (15,3%)
Lob	870 (17,8%)	1463 (20,4%)	2333 (19,4%)
Net-shot	525 (10,8%)	903 (12,6%)	1428 (11,8%)
SOS	146 (3,0%)	197 (2,7%)	343 (2,8%)
LOS	118 (2,4%)	63 (0,9%)	181 (1,5%)
SCS	200 (4,1%)	336 (4,7%)	536 (4,4%)
LCS	150 (3,1%)	116 (1,6%)	266 (2,2%)
Smash	128 (2,6%)	281 (3,9%)	409 (3,4%)
Total*	**4879 (40,5%)**	**7175 (59,5%)**	**12054 (100,0%)**

Key: SOS = short open service (Forehand); LOS = long open service (Forehand); SCS = short close service (Backhand); LCS = long close service (Backhand).
*Comparison of the frequency of actions between WH1 vs WH2: $\chi^2 2 = 437.3$; df = 1; p <0.001.

The distribution of most frequent strikes performed by the players, by game, can be visualized in table 7.

Table 7: Distribution of Absolute and Relative Frequency of Strikes Performed by Players in Each Game

Classes	Strikes	Game 1 (n; %)		Game 2 (n; %)		Game 3 (n; %)		Total (n; %)	
WH1	**Clear**	925	40,9%	944	40,3%	113	40,4%	1982	40,6%
	Drive	9	0,4%	12	0,5%	2	0,7%	23	0,5%
	Drop	347	15,4%	349	14,9%	41	14,6%	737	15,1%
	Lob	403	17,8%	420	17,9%	47	16,8%	870	17,8%
	Net-shot	225	10,0%	261	11,2%	39	13,9%	525	10,8%
	SOS	59	2,6%	75	3,2%	12	4,3%	146	3,0%
	LOS	43	1,9%	57	2,4%	18	6,4%	118	2,4%

	SCS	112	5,0%	85	3,6%	3	1,1%	200	4,1%
	LCS	81	3,6%	68	2,9%	1	0,4%	150	3,1%
	Smash	55	2,4%	69	2,9%	4	1,4%	128	2,6%
	Total	**2259**	**46,3%**	**2340**	**48,0%**	**280**	**5,7%**	**4879**	**100,0%**
	Strikes	**Game 1 (n; %)**		**Game 2 (n; %)**		**Game 3 (n; %)**		**Total (n; %)**	
WH2	**Clear**	914	32,2%	1188	37,4%	533	46,1%	2635	36,7%
	Drive	36	1,3%	38	1,2%	5	0,4%	79	1,1%
	Drop	449	15,8%	484	15,2%	169	14,6%	1102	15,4%
	Lob	587	20,7%	667	21,0%	209	18,1%	1463	20,4%
	Net-shot	419	14,7%	364	11,5%	120	10,4%	903	12,6%
	SOS	88	3,1%	80	2,5%	29	2,5%	197	2,7%
	LOS	23	0,8%	37	1,2%	3	0,3%	63	0,9%
	SCS	148	5,2%	158	5,0%	30	2,6%	336	4,7%
	LCS	55	1,9%	42	1,3%	19	1,6%	116	1,6%
	Smash	123	4,3%	119	3,7%	39	3,4%	281	3,9%
	Total	**2842**	**39,6%**	**3177**	**44,3%**	**1156**	**16,1%**	**7175**	**100,0%**

Key: SOS = short open service (Forehand); LOS = long open service (Forehand); SCS = short close service (Backhand); LCS = long close service (Backhand).

Of the 10 WH1 games recorded, only one had a third game dispute, which explains the significant difference between the number of strikes performed between the games, shown in table 7. This is repeated in category WH2, in which only two of the 10 filmed games had a third game dispute.

In relation to the region of the court where most winners occurred, the front was the most frequent in both classes (WH1: 57.27%, WH2: 62.65%) (Table 8). Strapasson et al. (2014c, 2017) also found in their research that the frontal area of the court, in both categories, is the most vulnerable part, and can be explained by the greater difficulty of reach the shuttle due the problems related to trunk mobility.

Table 8: Region of the Court that most occurred Winners (Relative and Absolute Frequency)

Region of the court where the shuttle fell during WH1 matches												
	G1	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**Total**	**%**
Front	14	5	8	15	13	12	21	16	18	8	**130**	**57.27**
Back	7	17	14	10	9	3	18	8	6	5	**97**	**42.73**
											227	
Region of the court where the shuttle fell during WH2 matches												
	G1	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**Total**	**%**
Front	13	15	23	15	12	16	15	12	14	16	**151**	**62.65**
Back	2	12	22	6	7	4	12	4	9	12	**90**	**37.35**

Key: G1 to G10 = Game 1 to Game 10.

Another important point are the winners (WH1: 33.98%, WH2: 33.38%), forced errors (WH1: 9.88%, WH2: 8.59%) and unforced errors (WH1: 56.14%, WH2: 58.03%). In this study, errors were more evident than winners in both functional classes, as shown in table 9. Increased amount of unforced errors (WH1: 62.69%, WH2: 63.95%) was also evidenced in the studies of Strapasson et al. (2014; 2017) compared to the number of winners (WH1: 37.31%; WH2: 36.05%). For the authors, the exacerbated amount of errors may be related to intense movement and the overload in the wheelchair.

Table 9: Results of Winners, Forced Errors and Unforced Errors of WH1 and WH2 matches

		Winners	Unforced Errors	Forced Errors
WH1	**AF**	**227**	**375**	**66**
	RF	33.98%	56.14%	9.88%
	Mean Value±SD	22.70 ± 6.93	37.50 ±11.48	6.6 ± 2.88
WH2	**AF**	**241**	**419**	**62**
	RF	33.38%	58.03%	8.59%
	Mean Value±SD	24.10 ± 8.63	41.90 ±12.21	6.20 ± 3.74

Key: AF: Absolute Frequency; RF: Relative Frequency.

The efficiency of actions was analyzed and the Smash was the most efficient in promoting winners in both functional classes (WH1: 10.16%; WH2: 10.68%), followed by Drop (9.63%), Net-shot (8.76%) and Lob (3.01%) for WH1 category, and Net-shot (6.98%), Drop (6.71%) and Lob (1.85%) for WH2 category. It is important to remember that both Drop and Net-shot are strikes in which the shuttle is directed to the front of the court (MANRIQUE, 2000; FONSECA, SILVA, 2012). According to Strapasson et al. (2016), the Smash was also the most efficient action in promoting winners (14%). Service and Clear proved ineffective in winning points, as identified by Strapasson et al. (2016). In relation to unforced errors, the off-court shuttles stood out (WH1: 71.2%, WH2: 63.09%), and forced errors were evidenced by the errors of reception (WH1: 49.50%, WH2: 49.21%). Majumdar (1997) and co-authors cite that fatigue generated by the high intensity of a Badminton game can interfere with the motor players' coordination causing negative effects on the correct execution of the strikes.

Anyway, a paper with data presented in this report is being written by the authors listed below and will be submitted to the journal "Adapted Physical Activity Quarterly - APAQ" in a few months:

- Aline Miranda Strapasson (Faculty of Americana – FAM);
- Thiago José Leonardi (Rio Grande do Sul Federal University – UFRGS);

- João Guilherme Cren Chiminazzo (Faculty of Jaguariúna – FAJ);
- Mário Antônio de Moura Simim (Ceará Federal University – UFC);
- Roberto Rodrigues Paes (State University of Campinas – UNICAMP).

Conclusion

In summary, according to the goals proposed in this study, we conclude that:

a) WH2 players performed a greater number of strikes in the shuttle and required a shorter pause time than WH1 players;
b) The region in the court that most occurred winners was the front part, therefore the most vulnerable area;
c) As for the motor actions during the games, both classes used strikes that required the front-back displacement of opponents on the court, with Clear, Lob, Drop and Net-shot being the most executed strikes. The Drive was the least executed strike in the matches being verified more frequently in class WH2;
d) The most effective strike in winning points was Smash in both functional classes;
e) The number of errors (unforced errors and forced errors) was higher than winners in both categories, indicating that, even at world level, the errors overlapped the hits;
f) It was verified that there is difference in the intensity of game between the categories, with greater intensity verified in WH2 class. The results indicated that WH2 class players perform more strikes in the shuttle and require shorter pause time than WH1 players.

It is hoped that this data will help professionals and interested persons to better understand the characteristics of PBd on wheels, in view of scarcity of specific bibliographic production. It is suggested that new studies related to temporal and technical analysis, with more games and different categories, be carried out with the intention of strengthening this new Paralympic modality.

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ANNEX - SUMMARY PRESENTED AT THE 6TH WORLD CONGRESS OF RACQUET SPORTS 2018 AND CERTIFIED

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GAME ANALYSIS OF WHEELCHAIR PARA-BADMINTON

Abstract

Para-Badminton (PBd) is a version of Badminton adapted for people with physical disabilities. It has a bright future and will make it's a Paralympic debut in 2020. The main purpose of this abstract is to characterize PBd matches from the WH1 category, in relation to aspects of the game such as; game time, strokes quantification, finalization points (winning points, unforced errors and forced errors) and area of the court where the shuttle landed (winners). Ten games from Men's single category, selected for accessibility, were filmed in 11th PBd World Championship (2017). A total of 66.8 (±15.53) points/game were contested. Of these, 37.5 were finished through unforced errors, 22.7 with winning points and 6.6 with forced errors. The average game time was 1780seconds (±575.05) and the average hit on the shuttle was 552 (±197.35). The most executed strokes were: Clear (40.61%), Lob (17.78%), Drop (14.86%), Service (12.92%), Net-Shot (10.78%), Smash (2.59%) and Drive (0.46%). The most effective stroke for the winning point was the Smash (9.70%) and the region of court that most winning points were obtained was at the front (57.27%). The characterization of PBd games is fundamental for understanding the dynamics of the game and can be useful in constructing a suitable coaching/training program, in addition to providing appropriate tactical advice during games.

Key words: *Paralympic Sport, Para-Badminton, physical disability*

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DIFFERENCES IN SINGLE BADMINTON PLAYER PROFILE BETWEEN LONDON 2012 AND RIO 2016 OLYMPICS GAMES

Abstract

The purpose of the study was to compare the profile of top world level badminton single matches between the London 2012 and Rio de Janeiro 2016 Olympic Games to observe the evolution of player profile. Players were the best on the world at the time they were selected (81 males and 86 females). Age (months), height (m), mass (kg) and BMI (kg/m^2) were determined. No differences were founded in any variable. However, the mean age in male players was lower in London (324,8±37,8 months) than in Rio (337,2±48,8 months). The average mass in male players was lower in London (71,6±7,4 kilos) than in Rio (74,0±7,1 kg). The profile in female badminton player is very similar in both Olympic Games. Knowing the profile of the player throughout the Olympic Games contributes to a better knowledge of this sport discipline.

Key words: *badminton, males, females, singles profile.*

6TH WORLD CONGRESS OF RACKET SPORT SCIENCE

25-26 May 2018 | **Bangkok, Thailand**

CERTIFICATE

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Game analysis of wheelchair para-badminton

Title

Virtual poster

Presentation

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