

Analysis of point difference established by winners and losers in games of badminton

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Abstract

The aim of this study was to analyze the point difference established at different phases of the game by the winners and losers in men's singles badminton matches. We analyzed 136 games from matches of the 2015 World Championship. From each game were collected the final result and the maximum point difference established by the players in each phase of the game. We considered from 0 to 7 points the first phase, from 8 to 14 the second phase and 15 to 21 the third phase of the game. We found that in all phases the winners had a superior point difference than the losers and this difference increased significantly over the course of the match. For all the players who were not ahead on the scoreboard in the first phase, 78% have lost the game. We found that one point ahead in the second and third phases was not enough for athletes to win the game. The winners had at least five points of difference to the opponent from the middle to the end of the game. The results presented are important to monitor the athlete's performance during the game and to readjust strategies based on point difference.

Key words: performance analysis, badminton, sports.

1. Introduction

During the 2000 years the badminton went through changes in relation to its scoring system. The current system, established in 2006 by the Badminton World Federation (BWF), consists of the best of three games of 21 points and to win a game the player needs a two-point lead (www.bwfbadminton.org). In the event of a tie, the game follows until a side gains a 2 point lead first or until a player scoring 30 points.

Since the new rule, studies have investigated matches differences and similarities in relation to the old system (Tu, 2007; Ming, Keong and Ghosh, 2008; Chen and Chen, 2008). The temporal structure of men's singles matches, such as duration, duration of the rally, pause time, effective time played, frequency of shots and shots by rally have also been quantified and described in the new scoring international matches ([Abian-Vicen et al., 2013](#); [Abián et al., 2014](#)).

The relationship between technical skills and players performance were also investigated in men's single matches ([Lee et al., 2008](#); [Zhang et al., 2013](#)). In relation to

the physiological aspects, Singh, Raza and Mohammad (2011) found that agility and flexibility of wrist are important variables for greater performance in badminton matches. Faude et al. (2007) showed the importance of anaerobic and aerobic energy systems in badminton matches. According to the author, the aerobic endurance is also important for fast recovery between rallies or intensive training exercises.

As was shown above, the temporal, technical and physiological characteristics of badminton matches in the new scoring system were widely studied. However, little attention was given to the variability of the points during the game and to its influence on the match outcome.

In other racket sports the scoring system has been widely investigated through mathematical modeling and statistics. The most studied racquet sport is tennis. Several studies proposed probabilistic models to predict the outcome of a tennis game or a match based on the points scored by the players (Fischer, 1979; Barnett and Clarke, 2002; Clowes, Cohen and Tomljanovic, 2002; Klaassen and Magnus, 2003; Barnett, Brown and Clarke, 2006; Barnett, O'Shaughnessy and Bedford, 2011).

In table-tennis, Marcus (2001) discussed whether the number of points that a player scored in a match should be used in the rating system. According to the author, the scoring difference between the players can be used to infer about competitiveness and performance level of the athletes. Besides that, Coupet and Réache (2007) proposed a statistical model to estimate the probability of victory of a set or a match based on the points scored by the players.

In squash, Clarke (1994) proposed a new rating system taking into account the points scored by the players during the games. According to the author, the points scored are a measured of performance in squash matches, thus it should be used in players' rating.

About badminton, there is only study, of our knowledge, which analyzed the new scoring system through a mathematical model (Percy, 2009). Although racquet sports studies have explored and recognized the importance of the points scored to the outcome of the match, none study has analyzed how the difference of points established during a badminton match may interfere on the game outcome.

Professionals involved in badminton training infer that the early stages of the match are important to game understanding. And it is known that the furthest ahead in score a player is in the final moments of the game, the more probability he has to win. Therefore, it is necessary to quantify and analyze the relationship between point difference established by the players and the game outcome. The aim of this study was to analyze the point differences established at different phases of the game by the winners and losers in international badminton matches of men's singles category.

2. Methods

2.1. Sample

In order to carry out this study, data from all men's singles matches played in the 2015 World Championships held in Jakarta, Indonesia, were collected. The championship was composed by round 1, round 2, round 3, quarter finals, semifinals and finals phases. There were a total of 59 matches played in men's singles category. These matches resulted in 136 games, which were all analyzed in this study.

After the championship, official game-related statistics were public available on the Tournament Software (www.tournamentsoftware.com), website which was used to data collection.

2.2. Procedures

All data were tabulated and arranged in Microsoft Excel worksheet. The Figure 1 shows an example of the graph available in Tournament Software website and which was used for data collection. From each game were collected the final result, to identify the winner and loser player, and the maximum point difference established by the players in each phase of the game. Also, we consider from 0 to 7 points the first phase, from 8 to 14 the second phase and 15 to 21 the third phase of the game. The point difference has been calculated from the moment that the player, winner or loser, was ahead on the scoreboard during the game (number of points scored minus the number of points conceded). We considered zero if the player was not ahead on the scoreboard any time during the phase. In the case of a tie-break, just points scored before de 21th point were considered for the analysis.

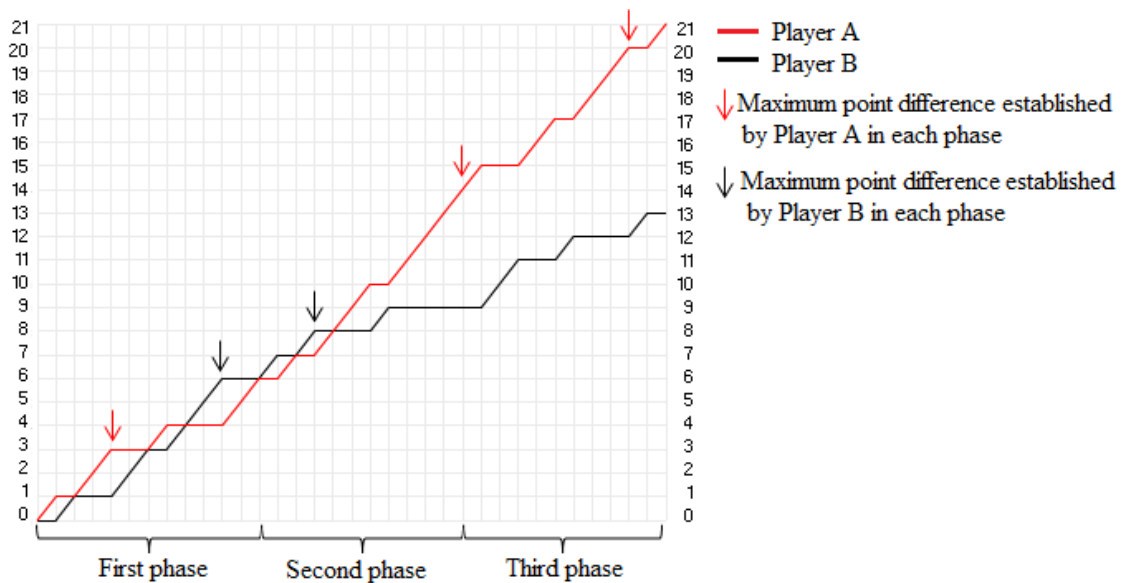


Figure 1. Graph used in data collection to analyze the score of winner and loser players throughout the game. Adapted from Tournament Software (www.tournamentsoftware.com).

2.3. Statistical analyses

The descriptive statistics, using average, median, standard deviation, quartiles, minimum and maximum, was used to characterize the data collected. The normality of the data was verified by the statistical test of Shapiro Wilk. To compare the maximum difference of points established by the winners and losers in the game we used the Mann Whitney test. The point difference among each phase was verified through the statistical test of Kruskalwallis with post-hoc of Dunn's. All the statistical analyses were performed on GraphPad Prism 6 (San Diego, California, USA). The level of significance adopted was $p < 0.05$.

3. Results

The analysis of maximum point difference established by the players during the game showed that losers opened a difference of, on average, 1.89 ± 1.77 points and the winners opened 7.20 ± 3.22 points ahead of the opponent ($p < 0.05$).

The players who lost the game, 24% were not ahead on the scoreboard at any phase of the game and 50% have opened the highest point difference of the opponent in the first phase of the game.

The players who were not ahead on the scoreboard at any time during the first phase of the game, 78% have lost the game.

Table 1 presents the characteristics of the point difference established in each phase of the match by winners and losers. The analysis of the players who lost the game showed that half of the athletes were not ahead on the scoreboard at any time during the second phase and in the third phase that frequency increased to 75%.

Table 1. Maximum point difference established at each phase by the winners and losers of the game.

	1 ^a Phase		2 ^a Phase		3 ^a Phase	
	Loser	Winner	Loser	Winner	Loser	Winner
Mean	1.4	2.7	1	4.8	0.3	7
STD	1.3	1.6	1.7	2.8	1	3.3
Median	1	3	0	5	0	7
75 th Quartil	2	4	1	7	0	9
Minimum	0	0	0	0	0	2
Maximum	6	7	10	12	6	16

In addition, winner players were on average five points ahead of the opponent in the second phase of the game and seven points in the third phase. On the other side, most of the losers were just one point ahead in score in the second phase of the game and did not open a superior point difference in the third phase.

Figure 2 presents the highest point difference established at each phase by the winners and losers of the game. In all phases the winners had a superior point difference than the losers. In addition, the winners showed a significant increase of that difference throughout the phases, while the losers showed a decrease.

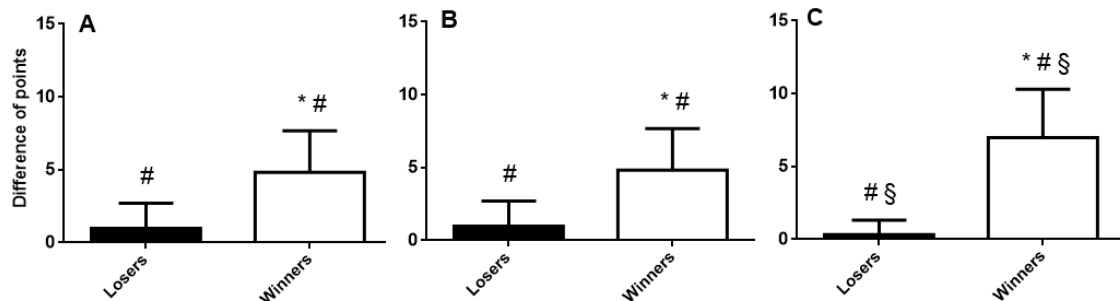


Figure 2. Maximum difference of points established at each phase by the winners and losers of the game. Legend: A – first phase, B – second phase, C – third phase, *- significant difference in relation to the loser, #-significant difference in relation to the first phase,§-significant difference in relation to the second phase, $p < 0.05$.

4. Discussion

From the analysis of the point difference established by the athletes in badminton matches, the winners had a superior point difference than the losers in all phases of the game. The highest point difference established by the losers was in the first phase of the game and by the winners was in the third phase. Only one point ahead on the scoreboard in the second and the third phase was not enough for the athlete to win the game. The winners opened at least five points of difference to the opponent from the middle to the end of the game.

In badminton, it has already been studied the differences between the amount of winners points and unforced errors made by winners and losers of the games (Tong and Hong, 2000; Cabello-Manrique and Gonzalez-Badillo, 2003; Yadav *et al.*, 2007). Similar studies with other racket sports also investigated differences in the frequency of technical skills performed by the winners and losers in squash (Vučković *et al.*, 2003, Vučković and James, 2010) and tennis matches (Filipčič *et al.*, 2008). However, none of these studies investigated the relationship between point difference established by the players and the game outcome.

In soccer, instead of point, the scoring system is based on goals. The goal difference was already explored in the scientific literature relating it to the teams' performance. Milanovic (2005) calculated the goal difference between winning and losing teams to infer about competitiveness of World Cup matches throughout the years. Heuer, Müller and Rubner (2010) calculated the probability distribution of the goal difference per match to investigate the fitness of a team. However, these studies calculated the difference based on the game outcome. Our study is innovative due to the possibility to access the scoring difference and to relate it to athlete's performance during the game.

Besides soccer, in table-tennis matches point difference was also considered a measure of performance (Marcus, 2001). We proposed the use of point difference between the players to analyze the athletes' performance in games of badminton. We found that winners opened a superior point difference in all phases of the game and this difference increased significantly over the course of the match. Therefore, it is important for the athlete who is losing to be reactive and not let the opponent's superiority to maximize this point difference. To be reactive, the athlete needs to maintain, or increase, his focus, concentration and attention on the actions of the match. According to Weinberg and Gould (2001), the loss of focus is a crucial aspect in the athlete's defeat.

The highest difference established by the losers, when they were ahead on the scoreboard, was in the first phase with this decreasing difference throughout the game. Opening only one point of advantage to the opponent in the second and third phase of the game did not approach athletes to win. When the advantage is at least five points difference to the opponent, from the middle to the end of the match, the athlete presents a great chance to win the game. According to Marcus (2001), the score of table-tennis match can reflect the playing style and tactics of the athlete. The information about point difference in games of badminton provided in study can be used during the match to modulate the tactics of an athlete allowing his greater performance and it also can be used in training by stimuli that allow the athlete to experience the adversity of the score.

The variability of point difference during a badminton match reinforces that, in addition to the technical and tactical training, the psychological aspects should be developed to help the athlete's balance and to provide a more competitive match.

In the first phase of the game, it was found a small difference between the points established by the winners and losers of the game. This phase seems to be fundamental for game understanding. According to Blomqvist, Luhtane and Laakso (2000), expert badminton athletes understand better the game situations than the novices. The results suggest that the success in a game of badminton depends not only of understanding the opponent's game, but also the fast understanding carried out mainly in the first moments of the match.

Of all the players who did not get any time ahead on the scoreboard in the first phase, 78% have lost the game. Therefore, the results of this study show the importance of being ahead on the scoreboard during the first phase to increase the chances of winning the game. The first phase of the game, besides being important for game understanding, it is also related to the game outcome. If the player was not ahead on the scoreboard anytime during the first phase, it is a great indicative that he will not win the game.

The results and analysis presented in this study provide valuable information for training and tactical development of badminton athletes. Similar analyses can be performed for other sports, allowing a greater understanding of the game and training planning targeted to the specific requirements of each sport.

5. Conclusions

The aim of this study was to analyze the relationship between point difference established at different phases of the game by the players and the game outcome. For that we considered from 0 to 7 points the first phase, from 8 to 14 the second phase and 15 to 21 the third phase of the game. The results showed that winners had a superior point difference than the losers in all phases of the game and this difference increases significantly over the course of the match. We also found that one point ahead in the second and third phases was not enough for athletes to win the game. The winners had at least five points of difference to the opponent from the middle to the end of the game.

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