

Comparative Analysis of Point Difference between Winners and Losers in Badminton Women Singles

Amritashish Bagchi^{1,*}, Anushree Burad¹, Shiny Raizada¹, Anshuman Mishra², Yash Mahimkar³

¹Symbiosis School of Sports Sciences, Symbiosis International (Deemed University), Pune, Maharashtra, India

²Government College of Physical Education, Bhubaneswar, Orissa, India

³Cardiff Metropolitan University, Wales, United Kingdom

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Abstract Point difference in individual sports for performance or match analysis is a very niche area. The purpose of the present study was to compare the point difference between the winners and losers in three different phases of international badminton women's singles matches. The data were only restricted to the 2019 World Championship matches of the women's singles category for which the data of 105 games were used. The variables that were selected for analyzing the performance were maximum point difference and maximum consecutive points. The points for each game were divided into three different phases and accordingly the data were collected for all the games. In all the phases, the winners were found to be significantly ($p < .05$) ahead of the losers and the difference kept on increasing significantly over the phases with medium to large effect size. All the players who were ahead in the first phase of the game have won 70.47% of the matches. Similarly, players who were not ahead at any point of time in the first phase of the game, 75% had lost the game. Winners also had significantly ($p < .05$) higher consecutive points than the losers ($ES = .65$). On average, the winners were 6 points ahead of the losers in the second and the third phase of the game. In badminton, the first seven points are most crucial as they significantly increase the chances of winning. In this study, compared to the losers, winners kept on increasing the point difference in every phase. Whereas, in losers, the point difference reduced from phase 1 to phase 3. The results are helpful in enhancing the winning chances by tracking players'

performance, developing strategies and tactics based on point difference.

Keywords Data Analytics, Badminton, Women Singles, Point Difference, Performance

1. Introduction

The term point difference in data analytics for performance analysis is new in many sports. There is a dearth of literature examining point difference in the context of both individual and team sports. A few studies have been done that deal with a goal difference in soccer. Some were focused on the margin of victory by analyzing the difference in the number of goals in soccer [1,2], whereas others were more focused on investigating the effect of goal difference by analyzing match running performance before and after a goal scored [3]. In badminton, Barreira et al. [4] have done a study on similar lines, but they restricted the research to men's singles badminton matches. No other studies were found in badminton that deals with point difference.

Badminton is one of the fastest sports in the world that requires immense fitness, skills and energetic rallies [5]. It also requires high-intensity movements of short duration [6]. The sport of badminton involves five disciplines, which are, men's singles, women's singles, men's doubles,

women’s doubles and mixed doubles. All these disciplines have their specific playing demands mainly due to gender differences [7]. Abian-Vicen et al. [6] has analyzed the temporal and notational structures between the elite men’s and women’s singles badminton matches. They have shown significant differences in variables such as match duration, rally time, rest time and shots per rally, where men were found to be higher than women.

Numerous international tournaments were organized by the Badminton World Federation (BWF) throughout the year for all the mentioned five disciplines. These tournaments have several leagues or knockout matches which consist of 3 games of 21 points. Before 2006, 3 games of 15 points were used to be played, but now it has changed to 3 games of 21 points in a match [8]. This triggered increased demand for scientific research on badminton due to changes in physical, technical and physiological conditions [9,10].

The initial stages of a match are vital for the prediction of the game’s outcome. The more ahead a player is during the match, the more probability he/she has to win the match [4]. Therefore, the point difference is vital for predicting the game’s outcome. It will help players as well as coaches in making strategies before the game and tactics during the game. Hence, the purpose of the present study is to analyze the point difference between the winners and losers in three different phases of international badminton women’s singles matches.

2. Materials and Methods

2.1. Participants

The data of the Badminton World Federation (BWF)

World Championship 2019 of women singles tournament was used. The tournament was held in Basel, Switzerland at St. Jakobshalle from 19th to 25th August. The data was collected from the official website of the Badminton World Federation (BWF) – tournament software (www.tournamentsoftware.com) and is publicly available after the championship. The championship draws consisted of initial 3 rounds, quarter-final, semi-final and final matches. It was a total of 105 games from 47 matches played in women’s badminton singles. For each of the games, maximum point difference (MPD; phase-wise) and maximum consecutive points (MCP) for winners and losers were separately recorded.

2.2. Procedure

All the data was gathered and organized in Microsoft excel. All 105 games were analyzed in this study. For analyzing the point difference in each game, the game was divided into three different phases, i.e. phase 1, phase 2 and phase 3. Phase 1 consisted of 0 -7 points, phase 2 consisted of 8 – 14 points, and phase 3 consisted of 15 – 21 points. As mentioned in a study done by Barreira et al. [4], the point difference is the maximum difference of point reached by the winner and/or loser during each phase of the game. In other words, it’s a single value of the maximum point difference in each phase by the winner and/or loser. It was calculated as the maximum point received by a player minus the minimum point conceded during a phase. A value of zero was given to the winner or loser in each phase if either of them has not taken the lead. For a tied game (i.e. 21 all), the maximum point difference (MPD) till 21st point was considered.

We have created a sample line graph (as shown in Figure 1) for a better understanding of the maximum point difference during each phase of the game.

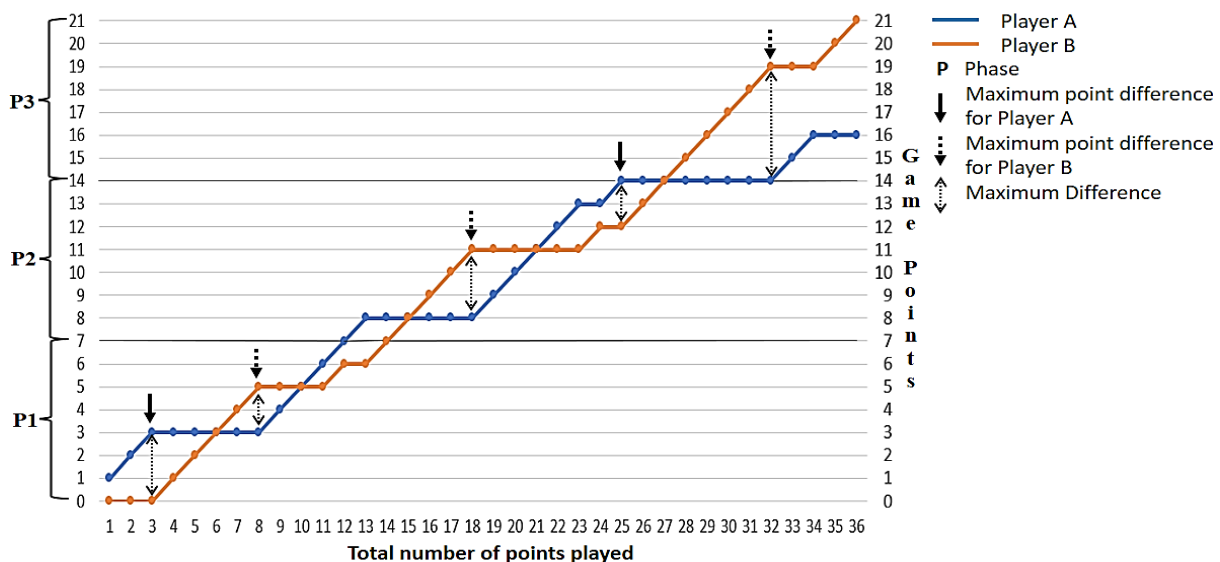


Figure 1. Maximum point difference (MPD) between winner and loser player during each of the phases of an entire game

2.3. Statistical Analysis

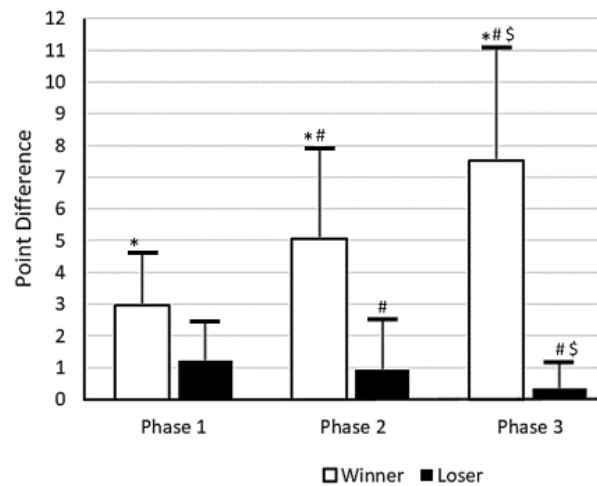
For the purpose of the study, descriptive statistics such as mean, median, standard deviation, Coefficient of Variation (CV), minimum and maximum were calculated. Skewness, Kurtosis, Standard error of Skewness, Standard error of Kurtosis, Shapiro Wilks test and Levene's test of homogeneity were used for checking the distribution of the data. Mann-Whitney U test was used to compare the maximum point difference between the winners and losers in each of the phases. It was also used to compare the maximum consecutive points (MCP). Kruskal Wallis H test was used to compare the point difference (winners and losers separately) between all three phases. Effect Size was used to calculate the magnitude of the differences. SPSS (Statistical Package for Social Science) version 24 was used for all the statistical analyses, with the level of significance held constant at .05.

3. Results and Discussion

The results of the present study indicate that in point difference winners (5.18 ± 3.35) are ahead of the losers (0.83 ± 1.32) across all the phases of the game. It can be seen from table 1 that losers have a high level of dispersion (around the mean) in point difference and also in scoring most consecutive points as compared to winners.

It was found that 70.47% of the players who were ahead in the first phase of the game won the match. The percentage was calculated as the total number of times a player led during the first phase of a game and won the game divided by the total number of times a winner and

loser led during the first phase of the game. Similarly, 75% of the players had lost the game, as they were not leading on the scoreboard at any point of time during the first phase of the game. It was calculated as the total number of games when a loser is not ahead at any point during the first phase divided by the total number of games a winner and loser are not ahead at any point during the first phase of a game. Kruskal Wallis H and Mann Whitney U tests were used for further analysis as the data did not meet the assumptions of normal distribution.



Note- * represents a significant difference in each phase in relation to the loser, # represents a significant difference in relation to the first phase and \$ represents a significant difference in relation to the second phase.

Figure 2. Mean and SD of maximum point difference between winner and loser during each of the phases of the games in the entire championship.

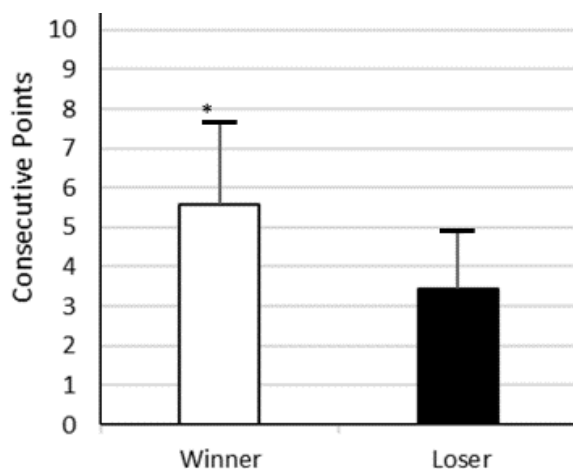
Table 1. Descriptive Statistics for phase-wise maximum point difference and maximum consecutive points of winners and losers

	Phase 1		Phase 2		Phase 3		MCP	
	Winner	Loser	Winner	Loser	Winner	Loser	Winner	Loser
Mean	2.97	1.21	5.06	0.93	7.52	0.34	5.56	3.43
Median	3	1	5	0	7	0	5	3
Std. Deviation	1.63	1.25	2.87	1.61	3.53	0.84	2.12	1.45
CV	0.55	1.03	0.57	1.73	0.47	2.47	0.38	0.42
Skewness	0.03	0.85	0.29	2.00	0.37	2.93	0.87	1.00
Std. Error of Skewness	0.24	0.24	0.24	0.24	0.24	0.24	0.23	0.23
Kurtosis	-0.68	-0.19	-0.29	3.78	-0.40	9.92	1.33	2.11
Std. Error of Kurtosis	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Minimum	0	0	0	0	1	0	0	0
Maximum	6	4	12	7	17	5	12	9
Shapiro-Wilk	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00

As shown in Figure 2, the maximum point differences were found to be significantly ($p < .05$) high in winners as compared to losers in all three phases. The effect size was calculated for each of the phases. In the case of phase 1 and 2, the magnitude of the differences was found to be medium .55. Whereas, in phase 2 and 3, a large effect size value of 1 was found. Similarly, a magnitude of 1.57 was found between phase 1 and 3. Hence, the difference between winners and losers were found to be very high with medium to a large magnitude. Also, the difference between the winner and loser kept on increasing throughout the phase.

While comparing the point differences for winners and losers in each of the phases, significant ($p < .05$) differences were found in all the phases of winners as well as losers. Point differences in winners were kept on increasing from phase 1 to phase 2 followed by phase 3. Whereas, in losers, the point difference reduced from phase 1 to phase 3. Post hoc test followed by effect size ($ES = \text{Chi-Square Value} / (n-1)$) for each significant difference was calculated.

Effect size showed a magnitude of .94 in the winner and .36 in the loser category while comparing the overall differences between all the three phases of winners and losers separately. In the case of winners, it showed significant differences ($p < .05$) across all the comparisons, with the effect size of .32 in the 1st and 2nd phase, .24 between the 2nd and 3rd phase and a large effect size of .86 in the 1st and 3rd phase. The losers also showed a significant difference across all comparisons, with an effect size of .08 between the 1st and 2nd phase, .09 between the 2nd and 3rd phase, and the maximum difference between the 1st and 3rd phase of .37.



Note- * represents the significant difference in each phase in relation to the loser.

Figure 3. Mean and SD of maximum consecutive points between winner and loser during all the games in the entire championship.

As shown in Figure 3, there is a significant difference exhibited in maximum consecutive points between winners and losers with an effect size ($ES = Z^2 / (n-1)$)

of .65. Hence, it is implied that winners are likely to win the match due to more consecutive points.

The study showed that the winners displayed greater point difference than the losers in all phases of the game. In order to win the game, it is important for the player to not allow the point difference or the consecutive points of the opponent to increase. The winners' highest point difference was in the third phase, while for the losers it was in the first phase. However, on average, the winners were six points ahead in the second phase and the third phase of the game.

In women singles, the first phase of the game is very vital as it can be used to estimate a match outcome. It is important for players to take the lead during the first phase of the game as it increases the chances of winning. The second and third phase of the game demands for greater concentration, more endurance and tactical decisions to sustain the performance [11]. Therefore, players should try to take the lead at least once during the first phase of the game, as it will reduce the chances of losing. Several studies in other sports corroborate that the first stages of the matches were crucial to winning the match [12, 13]. As emphasized by Gomez et.al, the knowledge of scoring performance dynamics will help in making better strategies for the matches [11].

Although Barreira et al., [4] has analyzed the point difference between winners and losers among male badminton players, studies have concluded that the style of playing and selection of the shots in badminton between men and women are quite different [7]. In one of the studies, it was found that the work density and percentage of time played is higher in women singles and the drop was most commonly used by women as compared to men [6].

Manrique & Badillo, [14] has mentioned the relationship between unforced errors and winning shots in badminton singles between winners and losers. They have indicated that it is more probable to lose a match as the number of unforced errors per rally increases and players have more chances to win a match for performing more winning shots than the opponents. According to Chow et al., [15] an increase in stroke variability can change the existing patterns of play and speed is the scalar product to distinguish patterns of play in the game of singles. Similar studies have been conducted in badminton matches where certain measurable indicators were used to distinguish between winners and losers [16,17].

Other than point differences in Badminton, differences in goals have been studied in soccer. Buchheit et al., [3] found a relationship between lower goal differences with the greater running performance for both winning and losing teams in soccer and vice-versa. Similarly, Heuer et al., [18] has investigated the relation of changing the coach in professional soccer and its effect on the performance of the team in terms of goal difference.

A similar kind of research can be done with other sports as very limited literature is available in terms of analyzing

point differences in other formats of badminton and other sports. A mathematical prediction model for winning a match could be developed based on such data. The analysis of the proposed study is helpful for enhancing the chances of winning and also for predicting the game's outcome. It will help the coaches and players to make strategies before the game by analyzing the opponent. This will also help the coaches and players to change tactics during the game on the basis of the point difference.

4. Conclusion

The study was aimed to analyze the point differences established at different phases of the game by winners and losers in international women's singles badminton matches. For this purpose, a game was divided into three phases and the results showed that the winners' point difference increased, which helped them in winning the game and the losers were characterized by a decreasing point difference throughout the phases. This study can help the coaches and players to understand the game strategies, tactics and weaknesses of the players and accordingly provide training to face different game situations effectively. Also, the players should be trained to focus on the first phase of the game as it affects the match outcome significantly. The players should be trained for a variety of shots to take the most consecutive points in the game that leads to winning the match. When compared, the maximum point difference was found between the first and third phase for the winners and losers and this shows that keeping up from the start of the game is very important for the players.

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