

Qualitative Temporal Structure And Performance In Badminton Competition

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Introduction

Badminton is a quick, complex and dynamic sport (both physically and mentally) in which each player tries to destabilize the opponent's balance and in turn generate disorder, while trying to maintain its own stability and self-organization when leading the rallies (Chow, Seifert, Héroult, Chia and Lee, 2014). In fact, badminton is a sport of constant adaptation (Abian et al., 2014) and evolution due to its dynamical temporal structure.

Specifically, Cabello et al. (2004) studied the time structure of badminton competition in tournaments of 5 different levels: junior national, junior international, senior national, senior international and world championships). The authors found, that the greater the level of the competition was the fewer the differences between men and women's singles were. That is, unlike national and intermediate international tournaments (junior and senior), world-class level shows no significant differences in the total playing time, total work and rest times. In contrast, Abian et al. (2013), claim that under the current scoring system at the 2008 Beijing Olympic Games, men's singles players significantly played longer matches, longer rallies, rest more between rallies, played more rallies per match and shots per rally at a higher frequency than the women's singles players who have in turn a greater work density and percentage of time played. Assuming that Cabello et al.'s (2004) and Abian et al.'s (2013) studies match each other concerning the level of the competitors engaged in different top competitions they fail to prove how the quality of opposition may influence these findings and mask their interactive effects.

Thus, the aim of the present study was to show that the both the temporal structure of badminton and the outcome, for both men and women are influenced by the relative quality between the players as well as other variables such as, match status, score and game period. It was hypothesised that the profiling technique that accounts for quality of opposition equation will solve any kind of controversy/discrepancy to yield proper results to be used for practical purposes. Additionally, we intend to generalize a new method to gather new qualitative and useful temporal information in badminton matches for all the levels of competition.

Methods

We investigated men's singles (N=46) and women's singles matches (N=56) from the BWF Super Series circuit and World Championships in order to see whether the following variables have an impact on how the game is played:

- **Independent variables:** sex, quality of opposition, set, game period (First 11, Last 11, Setting) and match status (0-2 points, 3-4 points and 5-more points of difference).
- **Dependent variables:** *Rally Time*: time elapsed from the current serve until the shuttle hits the ground; *Rest Time*: time elapsed from the moment the shuttles hits the ground until the racket impacts on it on the following serve; *Shots per Rally*: the total number of times the shuttle is hit by both players from the serve until it hits the ground; and *Shot frequency*: time elapsed between two consecutive shots.

The project was carried out by validating an observation scale and creating a tool on a video analysis program (Dartfish) on which 4 observers could be trained on the analysis of the relevant variables.

Concerning the quality of opposition we will use the O'Donoghue and Cullinane's (2011) regression-based approach. The relative quality (RQ) between two players (A and B) is defined as the difference between the quality ratings of both players (R_A and R_B) engaged in a match. As an indicator of performers' quality the 2015 world ranking will be used ($Rank_A$ and $Rank_B$).

Results

Badminton time structure differed from women to men; men would play longer rallies containing more number of strokes at a highest pace and rest for longer. However, these differences fluctuated throughout the stages of the match depending on the score status. Particularly interesting is the lack of differences when the set or match is in maximal equality, that is 19-all onwards, where it appears that women match the men's structure of the game in all the four variables. The quality of opposition has been found to be a key factor since all variables studied are affected somewhat.

Another interesting result is that women make more unforced mistakes and less winners than men when they serve but not in service return situations. That means that serving or returning also have an impact on the outcome of the rally and that it is different distributed for men and women.

Last but not least, we introduce an example on what the analysis/evaluation of relative quality of opposition would be; a regression-based approach in which the relative quality (RQ) between two players (A and B) is defined as the difference between the quality ratings of both players (R_A and R_B) engaged in a match. . In fact, the predicted values allowed indicating whether the player performed better or worse than expected. The evaluation score percentage (ES%) allows to improve the quality of this information. For example, values around 50% would indicate a performance close to the median (percentile 50) of the player's performance.

Discussion

These results show that in order to establish a performance and temporal structure of badminton there are many variables to be accounted for. As it was stated in the introduction the relative quality of opposition is a great source of variability, and so it has been proven in our study. Previous results missed these differences in such a straight forward fashion. Furthermore, we can state that temporal and performance structure of badminton not only depends on the level of the players engaged in action but also on another variables such as score line, criticality and set. We can conclude, as well as Cabello et al., (2004) and Gawin et al., (2015) that the higher the level is the fewer the differences found between men and women. That contrasts with Abian et al's., (2014) results which claimed that there were differences between men and women. Further studies will be needed to apply this methodology in junior tournaments and lower level BWF sanctioned tournaments.

Conclusion

The regression based model appears to be a useful tool, to be explored in a deeper way to monitor players' performances, throughout tournaments or during the whole season. This model is extremely important to compare what the actual performances are with the kind of training conducted and more importantly how they are expected to perform with opponent of different level.

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