

# Comparison of the service and reception between winning and defeated high-level table tennis athletes

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## ABSTRACT

The aim of the present study was to compare service and reception in winning and defeated Table Tennis athletes. The sample of the survey consisted of 64 games (34 men and 30 women) of the A1 Table Tennis Greek national league, where a total of 5,065 points were analysed between 33 male athletes and 18 female athletes, who are among the best 32 of the official Hellenic Table Tennis Federation ranking. The variables analysed were: service grip, service execution length, reception technique, reception movement, the point conquest of the serving athlete and the point advantage in the first three hits. The non-parametric-square test( $\chi^2$ ) showed that statistically significant differences were found between winning and defeated men, in the length of the service, with winners having a more effective service and more offensive reception. As for the female athletes, statistically significant differences were found in the grip and length of the service between winning and defeated women, while it was found that the winners have better service, perform defensive shots in the reception, and have an advantage in the first three hits. The above findings will help high-level athletes, coaches, physical trainers and performance analysts in understanding the importance of serving and receiving in high-level Table Tennis.

**Keywords:** Performance analysis of sport, Table-tennis, Service, Receive.

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## INTRODUCTION

Table tennis is a special and quite demanding sport, as athletes have to plan tactics and make decisions in a very short period of time in addition to physical fatigue. Considering the technical and tactical variables, it is very difficult to determine the winning or defeating factor. For this reason, the detailed analysis of the game is a crucial point for the table tennis athletes and coaches. Statistics resulting from the analysis of matches or entire tournaments, which are shown through the rallies are very important and give a lot of information, especially in technical data (Malagoli Lanzoni et al, 2014; Munivrana et al., 2015). Researchers usually focus on the analysis of technique, effectiveness, as well as tactical parameters. Through the recording and analysis of these aspects, individual performance is determined (Djokic et al., 2020).

Scientific research on performance analysis in table tennis is limited compared to other sports; however, in recent years there has been great emphasis on this field. Lei and colleagues (2017) analysed the characteristics of the match to enhance the understanding of the physical needs and the energetic demands of elite table tennis athletes in order to use better and more accurate training among eleven athletes with great experience and 22 played matches. Besides, the analysis of matches using video can provide coaches with valuable information that can significantly determine the outcome of the match (Wu & Escobar, 2007).

Serving in table tennis is a very complex and demanding skill that requires fast movement and precise control. The ability of an athlete to serve effectively in table tennis is a very crucial part of the match, as it enables the athlete to score points quickly and gain a significant advantage (Yu, Shao, Baker, & Gu, 2018). In particular, the effectiveness of the service depends also on the opponent's ability to judge the ball's spin and its location on the table (Geske & Mueller, 2010).

The reception of service has the same value as the service, especially after the changes in the rules (Djokic et al., 2019a). The athlete receiving the opponent's service has many possibilities on how to return the ball, he or she can choose a defensive or an offensive shot, in the front or back zone of the table and completely change the rhythm of the rally. Therefore, the collection of strategy and tactical data is very important (Padulo et al., 2016).

The aim of the present study was to compare the service and reception between the winning and defeated high-level Table Tennis athletes.

## METHODOLOGY

### ***Participants***

Athletes were 33 male and 18 female athletes in the best 32 positions of the official Hellenic Table Tennis Federation ranking. All the matches recorded for the needs of the research concerned the men and women A1 league of the Greek Championship, during the 2019-2020 seasons. A total of 64 matches (34 men and 30 women, respectively) were recorded at 5,065 points for table tennis (2,160 women's points and 2,905 men's points). Twenty matches recorded in the men's category, ended 3-0, eight ended 3-1 and six ended 3-2, while in the women's category eighteen matches ended 3-0, eight ended 3-1 and four ended 3-2. The average age of men was 29.4 years old and 28.9 years old for women. All athletes recorded had an offensive style of play. For the present study, it was decided that each male athlete can be recorded three times and each female athlete twice. All the matches analysed were filmed by the official YouTube channel of the federation.

### **Procedures**

The process of analysing the matches started with the first service of the match and ended with the last point. The variables analysed for both male athletes and female athletes among winners and defeated were: a) Service grip: Forehand grip, Backhand grip, b) Service length: Short Service, Inside/Out service, Long service, c) Receive of service: Success receive, Fail receive, d) Shot used to Receive: Push, Topspin, Flick, Drive, e) Serving point result: Won point, lost point, f) Point analysis: Ace, Won the point on the 3<sup>rd</sup> ball, Won the point after the 3<sup>rd</sup> ball, Lost the point immediately after the service, Lost the point after the 3<sup>rd</sup> ball.

### **Statistical methods**

In order to achieve the reliability of the research, two very experienced coaches assisted in data collection, and only when their opinions on the sample came to an agreement, the data was collected directly in Microsoft Excel. The analyses were performed with the SPSS 20 software. For the statistical analysis of the data the non-parametric chi-square ( $\chi^2$ ) test was used for each categorical dependent variable to identify statistically significant differences between the classifications within each variable. For selected pairs of the categorical dependent variables chi-square ( $\chi^2$ ) test of independence was also applied to examine statistically significant relationships between them. The level of significance was set as  $p < .05$ .

## **RESULTS**

The application of the non-parametric chi-square( $\chi^2$ ) test showed significant differences in several variables, while in some there were no statistically significant differences.

Regarding the relationship between winning and defeated athletes and the serve execution grip, no significant differences were found between male athletes [ $\chi^2_{(1)} = 0.968$ ;  $p = .325$ ], but significant differences were found between winning and defeated female athletes [ $\chi^2_{(1)} = 20.668$ ;  $p < .05$ ]. (Figure 1).

Regarding the outcome of the length of the service on the final result of the match, there were significant differences between male [ $\chi^2_{(2)} = 16.402$ ;  $p < .05$ ] and female winning and defeated athletes [ $\chi^2_{(1)} = 21.048$ ;  $p < .05$ ] (Figure 2).

Regarding the service reception and the relationship between winning and defeated athletes, a significant difference was found in the category of men [ $\chi^2_{(1)} = 33.320$ ;  $p < .05$ ] but also in the category of women [ $\chi^2_{(1)} = 31.126$ ;  $p < .05$ ] (Figure 3).

Analysing the reception of the service, and specifically, the movements of successful receptions, significant differences were found only in female athletes [ $\chi^2_{(3)} = 27.924$ ;  $p < .05$ ] and not in men athletes [ $\chi^2_{(3)} = 10.434$ ;  $p > .05$ ], (Figure 4).

Furthermore, the analysis of the results showed that there is a significant difference in the point-scoring result, with the winning athlete serving both male [ $\chi^2_{(1)} = 70.330$ ;  $p < .005$ ], and female table tennis athletes [ $\chi^2_{(1)} = 111.549$ ;  $p < .005$ ] (Figure 5).

Regarding the hits of points, and the number of hits that determines whether a point is won or lost, significant differences emerged again in both male athletes [ $\chi^2_{(4)} = 77.243$ ;  $p < .005$ ], and female athletes [ $\chi^2_{(3)} = 123.014$ ;  $p < .005$ ]. (Figure 6).

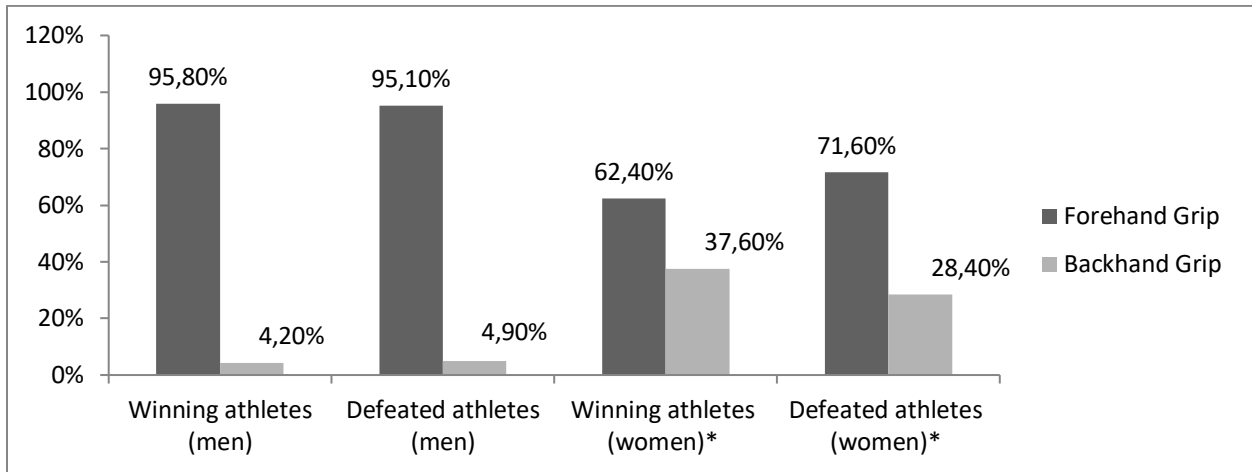


Figure 1. Service grip performance results between winning and defeated men ( $p > .05$ ) and women\* ( $p < .05$ ).

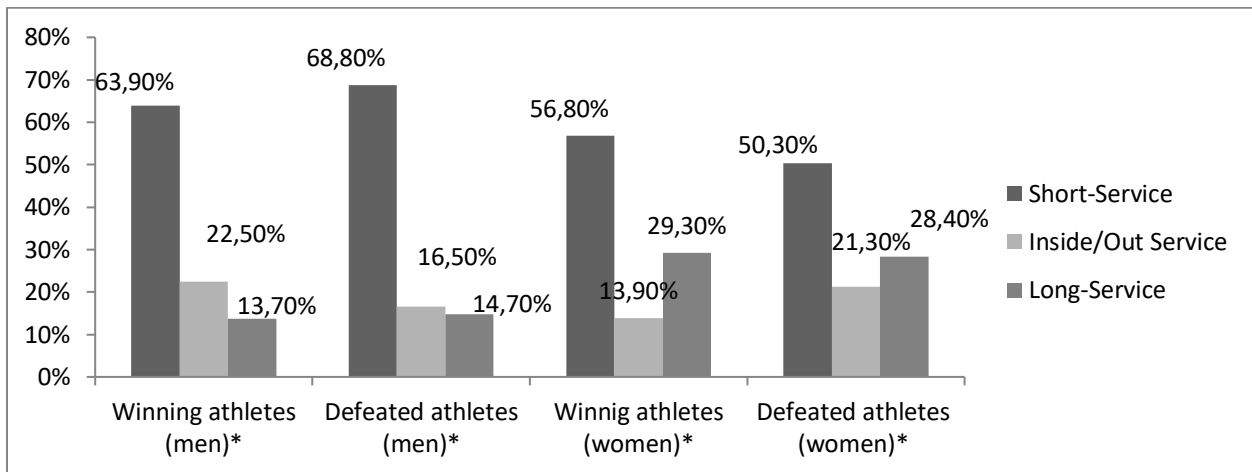


Figure 2. Service length results between winning and defeated men\* ( $p < .05$ ) and women\* ( $p < .05$ ).

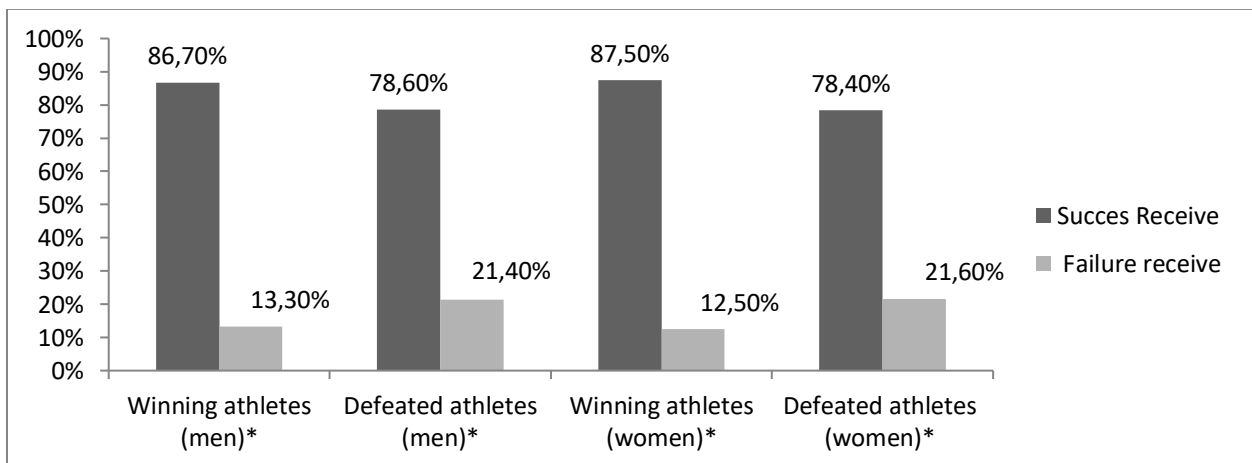


Figure 3. Service reception result between winning and defeated men\* ( $p < .05$ ). and women\* ( $p < .05$ ).

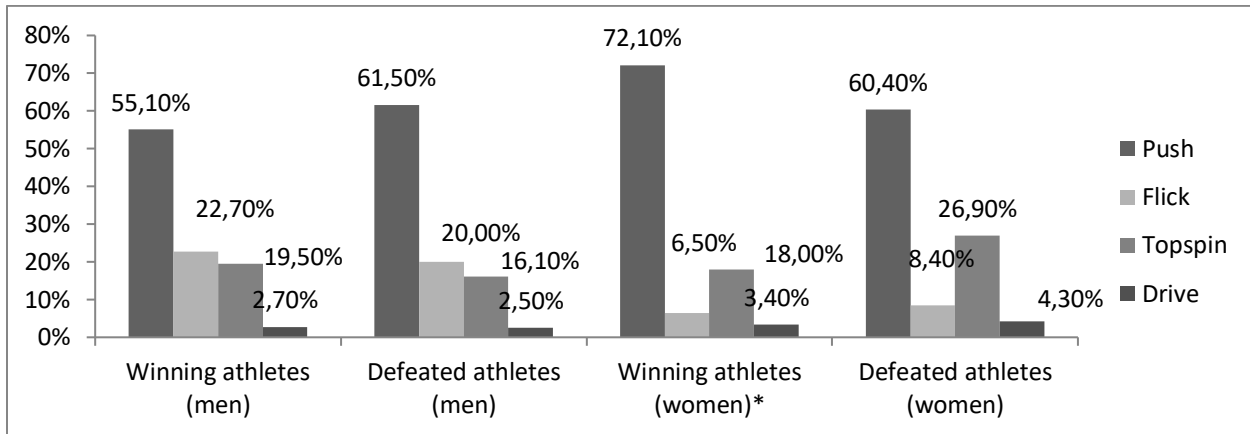


Figure 4. Results of hitting successful receptions of winning and defeated men ( $p > .05$ ) and women\* ( $p < .05$ ) athletes.

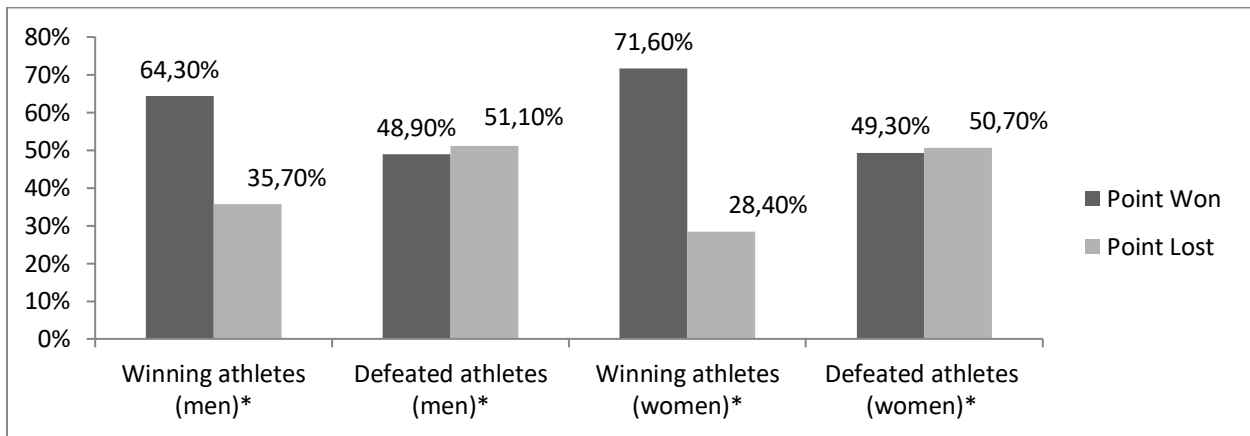


Figure 5. Results of conquest point of the serving athlete between winning and defeated men\* ( $p < .05$ ) and women\* ( $p < .05$ ) athletes.

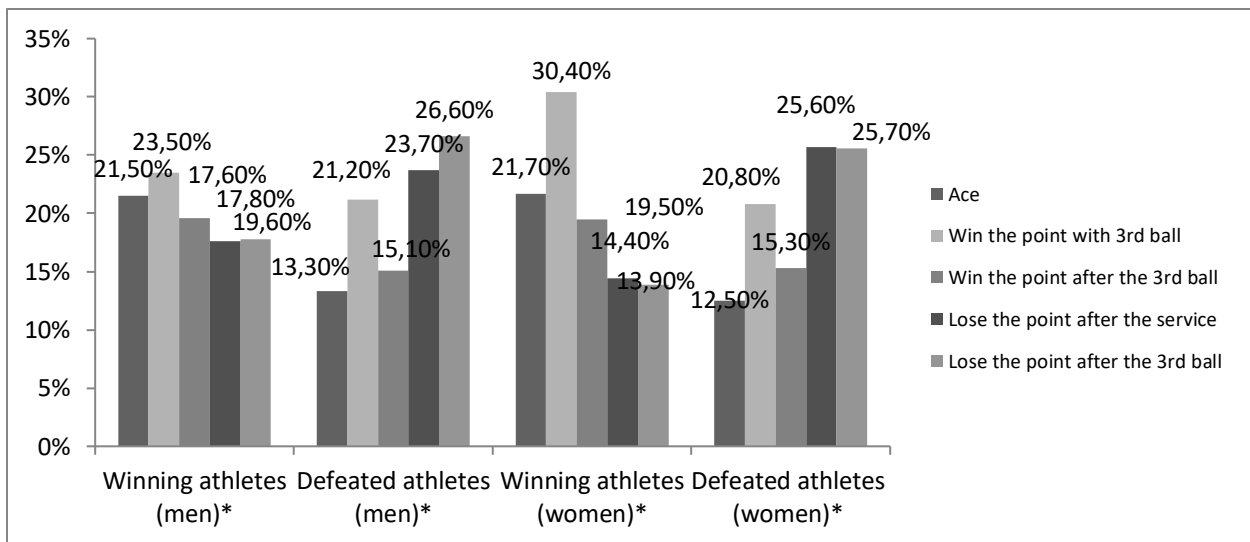


Figure 6. Results of point ending hits between winning and defeated men\* ( $p < .05$ ) and women\* ( $p < .05$ ) athletes.

## DISCUSSION

In the present survey, comparing the percentages of winning and defeated male and female table tennis athletes, statistically significant differences were found in almost all the variables under consideration between both winning and defeated men and women. In general, male and female winners are more effective in serving, in receiving, in scoring points when they serve, but also when they receive. Moreover, several technical and tactical differences were found in the athletes' hits, in the grip of the service, in the way they serve and in the shots of receiving the service. Starting with the service execution grip, no statistically significant differences were found in the men's category. Winning and defeated athletes serve with a significant majority using the Forehand grip. The same conclusion was reached by the (Djokic et al., 2020) studying male elite level athletes on a pan-European level. Statistically significant differences were observed in the execution grip of women. Winning and defeated athletes may primarily serve with a forehand grip, but the results show that the winners trust the backhand grip more than the defeated ones. These results contrast with the researchers Luini et al.(2021), as the findings of their research conducted on young elite female athletes of European elites, analysing and comparing 50 matches, showed that the main execution grip is the forehand grip, and there were no statistically significant differences between winning and defeated athletes.

Moving on to the length of the service, starting from the category of men, based on the results, statistically significant differences were found between winning and defeated men athletes. In general, both categories perform Short-service with the biggest difference being in Inside/Out – Service rates (W/22.5% - L 16.5%). Similar results were obtained by Djokic, Munivrana & Levajac (2015) who studied the 2014 finals between China and Germany. Among 214 services, it was observed that the dominant service was again Short-Service, but the defeated athletes performed more Long-Service. In the women's category, the percentages are more divided (W/short 39.7%, W/Inside – Out 13.2%, W/long 47.2%, L/short 36.4% L/ Inside – Out 15.6% L/long 47.9%) but again, services near the net are dominant, with the winners performing more services in this area, which contrasts with similar research in women of a younger age group where the first choice of the female athletes is Long-Service. (Nikolakakis et al., 2022a).

Continuing with the reception of service, according to Figure 3, there are statistically significant differences between winning and defeated athletes in both the male and female categories. The winning men and women have better service reception success rates than the defeated athletes with a difference of up to 10%. There are many types of research confirming that the winners are better received than the defeated ones and even at different levels and different ages of athletes (Nikolakakis et al., 2022b; Katsikadelis et al., 2013; Djokic et al., 2019b). Interesting are also the moves that the male and female athletes of the A1 league receive the service. In men, no statistically significant differences were observed, with the Push shot being the preferred technique, and with an overwhelming majority. This is followed by the Flick, Top Spin and Drive moves. On the other hand, in women, there seems to be a statistically significant difference as, according to Figure 5, the winning athletes have higher percentages in neutral-defensive push shots and lower percentages in offensive movements. Statistically significant differences were also observed in both categories in the point conquest of the serving player. Through Figure 6, it can be seen that both male winners and female winners rely heavily on the service and win percentage more points than the defeated ones when serving. The same results were obtained by Djokic and Colleagues (2017) analysing the 2015 Baku Pan-European Games, where among 45 athletes and 4,649 rallies, they found that the winners won points when serving at a rate of 60.6% and lost points at a rate of 39.3%, while the defeated athletes won fewer points when serving at a rate of 46.7% and lost more points at a rate of 53.2%. Furthermore, statistically significant differences were also found in the way of scoring points in combination with the number of exchanges of hits in both categories.

The male winners execute more aces than the defeated ones with a difference of about 10%, win marginally more points on the 3<sup>rd</sup> ball, and lose far fewer points after serving. Women athletes also execute more aces with a difference of 8%, they score more points on the 3<sup>rd</sup> ball with a percentage difference of 10%. Serving and receiving have a significant impact on the outcome of the match (Guo-bing & Shuai, 2015). Also, Ma and colleagues (2015) point out that the key to winning a high-level match is to gain an advantage in the first three hits which depend mainly on the service and reception.

## CONCLUSIONS

The results of the present research showed that winning and defeated athletes serve with a forehand grip, while in terms of length of the service both categories serve close to the net and inside-out service. Winning men also have better reception, execute more offensive shots, get more points when serving, more aces, and more points from the reception and the third ball. In the women's category, both categories of women were found to serve from the backhand side and from the centre of the table, while in the service grip the winners perform more with a backhand grip and less with a forehand grip than the defeated women. Also, the winners have better reception and service, serve close to the net, their reception hits are more passive and they win more points in the first three hits. In general, the winning athletes, men and women have an advantage when serving, they have better quality receptions.

The above results will help male and female high-level table tennis athletes in understanding the importance of serving and reception. Useful conclusions will also emerge for the coaches who will probably change the training mode and focus on service and receiving. Table tennis coaches should focus on individual serving and receiving drills on a daily basis. A good solution would be to start each training session with serve and reception, while they could also use serve and receive in footwork exercises. Also, the position used during the serve needs to be better prepared from a physical point of view in order to prevent injuries and to improve the performance. The improvement of the service and reception of the athletes is a very important factor and these skills are able to greatly affect the outcome of the match. Future research could collect more data or investigate different age groups. They could also focus on other technical movements and parameters that affect the outcome of the match. They would also be able to compare athletes' matches from their developmental ages until they reach a high level in order to track the development of the athletes and the evolution of the sport.

## AUTHOR CONTRIBUTIONS

Andreas Nikolakakis: Design the study and write the article. Andreas Nikolakakis and Pavlos Telopoulos: collect the data and analyse the results. Ivan Malagoli Lanzoni: write review and useful comments. Ivan Malagoli Lanzoni and George Mavridis: critical revisions for important content.

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## DISCLOSURE STATEMENT

No potential conflict of interest were reported by the authors.

## DATA AVAILABILITY STATEMENT

The authors declare that data supporting the findings of this study are available within the article.

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