

ANALYSIS OF THE TEMPORAL STRUCTURE IN PICKLEBALL

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Abstract: *Pickleball is a racket sport that originated in the United States. It can be played individually or in pairs. In the last decade its practice has experienced a remarkable growth, expanding rapidly from the United States to Europe. The aim of this study is to analyse the temporal structure of the sport of pickleball. To carry out this research, an ad hoc observational tool composed of a notational system was designed using LINC Plus 2.1 software. Two experienced observers with a high reliability index (k -index >0.9) observed the matches corresponding to the men's and women's finals of the Pickleball World Championship 2023 (USA). The time variables recorded in this study were total playing time (TT), real playing time (PT) and rest time (RT), which included breaks between points and between games as well as requested time-outs. The results obtained indicate a TT of 35.2 min for the men's competition and 44.8 min for the women's competition. The PT values were 15 ± 11.6 s for men and 10.6 ± 5.2 s for women, while the RT values were 14 ± 8.4 s for men and 11.4 ± 6.5 s for women. Statistically significant differences were found in all the time variables analysed ($p < 0.05$). The total duration of the matches is longer in the women's competition; however, the men's competition has higher activity and rest times than the women's competition. The time parameters studied are very interesting markers to analyse more accurately the physical, metabolic and physiological requirements necessary in pickleball.*

Key words: *racket sports, gender, competition, game structure.*

INTRODUCTION

Racket sports have traditionally been the subject of numerous scientific investigations (Lees, 2003; Krizkova et al., 2021; Cádiz et al., 2023). One of the most analysed parameters due to its interest for training and sport performance is the game density, known as the temporal relationship between activity and pause times during game actions. The analysis of the temporal structure of competitive play provides relevant information on the duration and type of effort made during technical and tactical actions (Gutiérrez, 2010).

Pickleball is a racket sport that is played in singles or doubles and combines different elements of tennis and padel. In recent years this sport has become very popular, growing worldwide and increasing its practitioners exponentially among all types of population from young people to the elderly (Smith et al., 2016). Vitale and Liu (2020) point out that the globalisation and expansion of Pickleball is due to the fact that its practice requires low skill, is less physically demanding and particularly has rules that are easy to understand. These game characteristics make this sport a very attractive activity for any age, making it a discipline applicable in the educational environment (Sancho-Tejo, 2021).

Although the interest in describing the sport of pickleball has increased in the last decade, there is scarce scientific evidence analysing the density of play in this sport. In this sense, the aim of this research was to analyse the temporal parameters that describe and characterise this sport.

METHOD

In order to carry out this study, a total of 2 matches corresponding to the men's and women's finals of the World Pickleball Championship 2023, held at the sports facilities of the Brookhaven Country Club (United States), were analysed.

The matches selected for the research were obtained through the platform YouTube©. The LINC Plus 2.1 software (Soto-Fernández et al., 2022) was used to analyse the temporal structure of the game. For its analysis, an observation tool designed ad hoc for this research was used, where the data obtained

were recorded and classified through a system organised into various categories that allowed the study of activity and pause times in a similar way to other studies (Fontes et al., 2014; Kilit, 2018; Pradas et al., 2021).

The notational system designed was elaborated following the guidelines of observational methodology (Anguera 2003). The categories that make up each of the observational criteria are exhaustive and mutually exclusive. Two observers with a high degree of experience in this sport participated in the observational analysis. The temporal results showed a high level of agreement, obtaining a Kappa index above 0.80 in all the variables analysed, considering the degree of agreement as very high (Altman et al., 1991).

In the analysis of the time structure, the activity and rest times in the men's and women's competition were studied. The downtimes considered were the breaks between each play, game and set, as well as the time-outs requested. The time variables analysed were the following: total playing time (TT; full match time, from the beginning to the end, considering game and rest periods), playing time (PT; duration of plays) and resting time (RT; duration of breaks). Finally, the variable game density, which is the ratio between PT and RT, was also analysed.

Statistical analysis was performed using IBM® SPSS® Statistics Version 21 (IBM Corp., Armonk, NY, USA). The statistical variables analysed were expressed with the mean, standard deviation, maximum and minimum as measures of dispersion. Normality was assessed using the Kolmogorov-Smirnov test. For normally distributed variables, Student's t-test was used, while for non-normally distributed variables the non-parametric Mann-Whitney U-test was used. All statistical comparisons were bilateral and a p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The results showed that the female competition has a longer duration than the male competition (TT: 2692 s vs. 2117 s; $p = 0.001$). Table 1 presents the values corresponding to the temporal structure of the gameplay of the moves.

Table 1 Analysis of the time structure of play by gender

Variables (s)	Man	Min	Max	Woman	Min	Max	p
PT	15±11.6	4	68	10.6±5.2	2	40	0.02
RT	14±8.4	3	63	11.4±6.5	2	46	0.03

Legend: PT – game time; RT –rest time; p – significance coefficient.

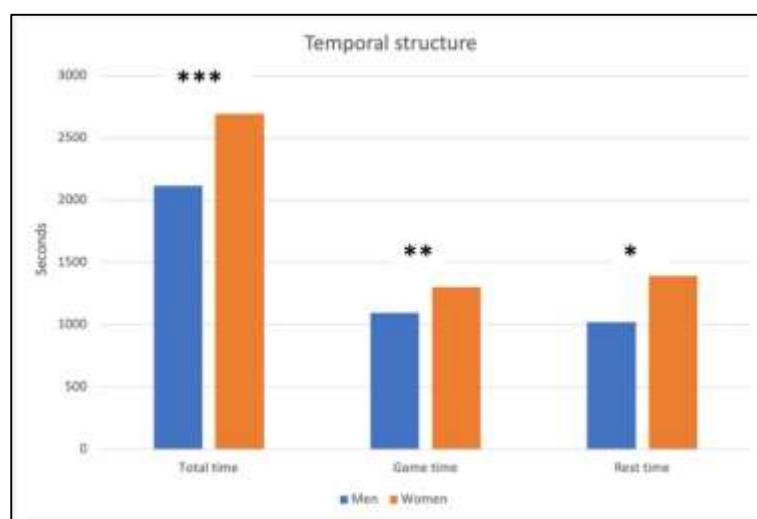


Fig. 1 Temporal structure analysis (* $p \leq 0.03$; ** $p \leq 0.02$; *** $p = 0.001$)

Statistically significant differences were found between sexes in all the variables analysed, being higher in the male competition (Figure 1).

Game density, as an indicator of analysis between playing time and pause time, shows a higher value in the men's competition when compared to the women's (1.07 vs. 0.9).

DISCUSSION

The aim of this research has been to analyse the time parameters that describe and characterise this sport. The study and analysis of the temporal structure of the game is of great interest to know precisely the physical, physiological and metabolic needs involved in the practice of pickleball. These data are essential to discover the type of activity carried out at a temporal level, as well as the impact that the practice of this sport can have on the players' organism, paying attention in this research to possible differences according to gender.

The results obtained in this study indicate that women's competition has a higher TT than men's competition. These results are similar to those described for padel (Sánchez-Alcaraz et al., 2018), but far from other racket sports such as table tennis (Pradas et al., 2021) or badminton (Abián et al., 2013).

The duration of playing and pause actions are other variables under study in sport, due to their great importance in adapting training and optimising performance. Their analysis makes it possible to quantify the physical, physiological and metabolic demand related to the efforts made in competition. In this research, higher time values of the PT and RT variables have been found in men's competition, similar to other racket sports such as table tennis and badminton (Abián et al., 2013; Pradas et al., 2021), but contrary to what happens in tennis (O'Donoghue & Ingram, 2001), or in paddle tennis (Sánchez-Alcaraz et al., 2018) where these variables are higher in women's competition.

CONCLUSIONS

The total duration of the matches is longer in the women's competition, however, the men's competition has higher activity and rest times than the women's competition. The time parameters studied are very interesting markers to analyse with greater accuracy the physical, metabolic and physiological requirements necessary in pickleball. The data obtained on the different time variables observed are presented as very reliable indices to be taken into consideration in order to organize, plan and optimally orientate the training and performance of the players.

REFERENCES

1. Lees, A. (2003). Science and the major racket sports: a review. *Journal of Sports Sciences*, 21 (9), 707–732 <https://doi.org/10.1080/0264041031000140275>
2. Krizkova, S., Tomaskova, H., & Tirkolae, E.B. (2021). Sport Performance Analysis with a Focus on Racket Sports: A Review. *Applied Sciences*. 11 (19), 9212 <https://doi.org/10.3390/app11199212>
3. Cádiz, M.P., Pradas, F., Moreno-Azze, A., & Carrasco, L. (2023). Physiological demands of racket sports: a systematic review. *Front. Psychol.* 30 (14), 1149295. <https://doi.org/10.3389/fpsyg.2023.1149295>
4. Gutiérrez, A. (2010). La utilización del parámetro temporal en La Actividad físico-deportiva. *Acción Motriz*, 4, 25-31.
5. Smith, E. (2021). Evaluación de un programa de Educación Física basado en el modelo de educación deportiva. *Sportis. Scientific Journal of School Sport, Physical Education and Psychomotricity*, 7 (2), 321-343. <https://doi.org/10.17979/sportis.2021.7.2.7364>
6. Vitale, K., & Liu, S. (2020). Pickleball: Review and Clinical Recommendations for this Fast-growing Sport. *Current Sports Medicine Reports*, 19 (10), 406-413. <https://doi.org/10.1249/JSR.0000000000000759>
7. Sancho-Tejo, A.I. (2021). La iniciación deportiva a través de los deportes alternativos, aplicados desde el modelo comprensivo. Retrieved October 28 from <https://uvadoc.uva.es/handle/10324/45433>
8. Soto-Fernández, A., Camerino, O., Iglesias, X., Anguera, M.T., & Castañer, M. (2022). LINCE PLUS software for systematic observational studies in sports and health. *Behav Res* 54, 1263–1271. <https://doi.org/10.3758/s13428-021-01642-1>

9. Fontes, T.T., Chiminazzo, J.G. C., Dobránszky, I. de A., & Moraes, A.M. (2014). Análise da quantificação das ações motoras e da estrutura temporal no badminton. *RBPFEFEX - Revista Brasileira De Prescrição E Fisiologia Do Exercício*, 8 (50). <https://www.rbpfefex.com.br/index.php/rbpfefex/article/view/702>
10. Kilit, B., Arslan, E., & Soylu, Y. (2018). Time-motion characteristics, notational analysis and physiological demands of tennis match play: A review. *Acta Kinesiologica*, 12 (2), 5-12.
11. Pradas, F., de la Torre, A., Castellar, C., & Toro-Román, V. (2021). Physiological profile, metabolic response and temporal structure in elite individual table tennis: differences according to gender. *International journal of environmental research and public health*, 18(22), 11898. <https://doi.org/10.3390/ijerph182211898>
12. Anguera, M.T. (2003). *La observación*. In C. Moreno Rosset (Ed.), *Evaluación psicológica. Concepto, proceso y aplicación en las áreas del desarrollo y de la inteligencia* (pp. 271-308). Madrid: Sanz y Torres.
13. Altman D.G. (1991) *Practical statistics for medical research*. London: CRC Press.
14. Sánchez-Alcaraz, B. J., Courel-Ibáñez, J., & Cañas, J. (2018). Estructura temporal, movimientos en pista y acciones de juego en pádel: revisión sistemática. *Retos*, 33, 308–312. <https://doi.org/10.47197/retos.v0i33.55025>
15. Abian-Vicen, J., Castaneda, A., Abian, P., & Sampedro, J. (2013). Temporal and notational comparison of badminton matches between men's singles and women's singles. *International Journal of Performance Analysis in Sport*, 13 (2), 310–320. <https://doi.org/10.1080/24748668.2013.11868650>
16. O'Donoghue, P., & Ingram, B. (2001). A notational analysis of elite tennis strategy. *Journal of Sports Sciences*, 19 (2), 107–115. <https://doi.org/10.1080/026404101300036299>

ANALIZA VREMENSKE STRUKTURE PIKLBOLA

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Sažetak: Piklbol je sport sa reketom koji je nastao u Sjedinjenim Državama. Može se igrati pojedinačno ili u paru. U poslednjoj deceniji njegova praksa je doživela izuzetan rast, brzo se šireći iz Sjedinjenih Država u Evropu. Cilj ove studije je da analizira vremensku strukturu sporta piklbol u modalitetu parova. Da bi se sprovedo ovo istraživanje, dizajniran je ad hoc alat za posmatranje sastavljen od sistema zapisa pomoću softvera LINCE Plus 2.1.0 (<https://lince-plus.com/es>, Španija). Dva iskusna posmatrača sa visokim indeksom pouzdanosti (k -indeks $>0,9$) posmatrala su utakmice koje odgovaraju muškom i ženskom finalu Svetskog prvenstva u piklbolu 2023, održanom u Dalasu (SAD). Vremenske varijable zabeležene u ovoj studiji bile su ukupno vreme igre (TT), realno vreme igre (TR) i vreme pauze (TP), koje su uključivale pauze između poena i između utakmica, kao i tražene tajm-aute. Dobijeni rezultati ukazuju na TT od 35,2 min za mušku konkurenciju i 44,8 min za žensku konkurenciju. Vrednosti TR su bile $15 \pm 11,6$ sec za muškarce i $10,6 \pm 5,2$ sec za žene, dok su TD vrednosti bile $14 \pm 8,4$ sec za muškarce i $11,4 \pm 6,5$ sec za žene. U svim analiziranim vremenskim varijablama utvrđene su statistički značajne razlike ($p < 0,05$). Ako uporedimo ove podatke sa drugim sportovima sa reketom, možemo videti da piklbol traje veoma slično tenisu na pesku, ali kraće od padela.

Ključne reči: sportovi sa reketom, pol, takmičenje, struktura igre