


Padel: A Quantitative study of the shots and movements in the high-performance


JOSE IGNACIO PRIEGO¹ , JOSÉ OLASO MELIS², SALVADOR LLANA-BELLOCH¹, PEDRO PÉREZ-SORIANO¹, JUAN CARLOS GONZÁLEZ GARCÍA², MERCEDES SANCHÍS ALMENARA²

¹ Group of Applied Research in Sports Biomechanics (GIBD). Department of Physical Education and Sports, Faculty of Physical Activity And Sport, University of Valencia, Valencia, Spain.

² Institute of Biomechanics of Valencia (IBV), Polytechnic University of Valencia, Valencia, Spain

ABSTRACT

Priego Quesada, J.I., Olaso Melis, J., Llana-Belloch, S., Pérez-Soriano, P., González García, J.C. & Sanchís Almenara, M. (2013). Padel: A Quantitative study of the shots and movements in the high-performance. *J. Hum. Sport Exerc.*, 8(4), pp.925-931. Padel is a sport that has increasing its importance in recent years. Despite this evolution, there is a lack of scientific papers analyzing padel aspects, specifically about the quantification of movements and shots during match. The purpose of this study was to perform quantitative analyses of movements and shots in padel in order to establish the importance of each type. Twenty male professional players were recorded with a video during ten matches and movements (lateral, head-on and backward displacement, split-steps, jump for a smash, and turns pivoting on the right or left foot) and shots (direct and indirect drive, backhand, smash and lob, and direct volley) were identified, quantified and classified. A movement predominance was observed for the lateral displacement followed by head-on displacement and split-step. Direct volley (24.66%) and indirect lob (20.52%) were the most frequent shots, followed by direct smash (17.76%), indirect backhand (14.70%) and indirect drive (14.55%).
Key words: COMPETITION, GAME ANALYSIS, QUANTITATIVE STUDY, PERFORMANCE, PADEL.

 **Corresponding author.** GIBD. Facultat de Ciències de l'Activitat Física i l'Esport. C/ Gascó Oliag, 3. 46010. Valencia, Spain.
E-mail: j.priego.gibd@gmail.com
Submitted for publication May 2013
Accepted for publication November 2013
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202
© Faculty of Education. University of Alicante
doi:10.4100/jhse.2013.84.04

INTRODUCTION

Padel is a sport that has increasing its importance in recent years, and now is being practiced by people of all social status and physical condition (Corrales et al., 2008). According to Lasaga (2011), due to its specific characteristics, padel is considered as an attractive sport for everyone (Lasaga, 2011). Some of these characteristics are the dimensions of the court and the existence of walls, which facilitate returning the ball, thus motivating recreational players (Lasaga, 2011). A fact that evidences the relevant growth in the number of padel players is the evolution of padel licenses and clubs in Spain that since 1988 until 2011 have increased in a 101% and 73% respectively.

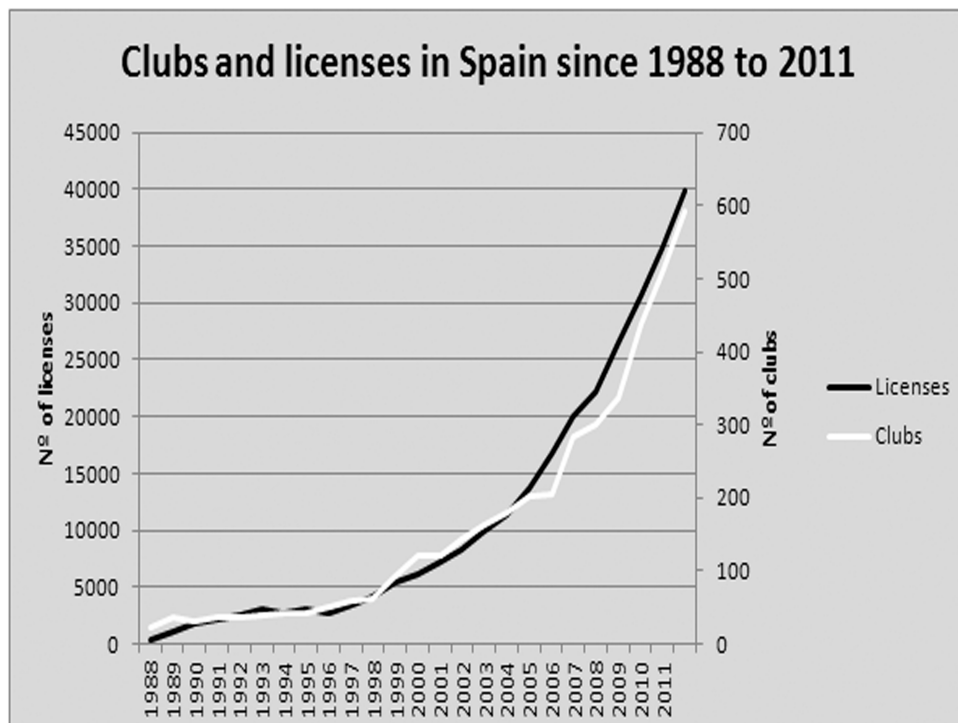


Figure 1. Clubs and licenses in Spain since 1988 to 2011. Information provided by the Spanish Federation of Padel

Despite this trend, there is a lack of scientific papers analyzing padel aspects (Hoyo Lora et al., 2007; Ruiz & Lorenzo, 2008). Specifically does not exist studies that done about the quantification of movements during match. Two studies did the quantification of the shots, however each one used a different shot classification which complicates their comparison (Almonacid-Cruz, 2011; Corrales et al., 2008).

The quantification of the movements of athletes during training and match-play can assist in the development of specific conditioning activities and recovery strategies (Duffield et al., 2010). In tennis, studies of this type have demonstrated the importance of lateral displacement due they are the predominant in the game (Kovacs, 2009; Llana-Belloch et al., 2013). Weber et al. (2007) observed in tennis that 70% of the movements are lateral displacements, 20% are head-on running, and less than 8% are backward running (Weber et al., 2007). Additionally, other study reported that 80% of all shots were done using less than 2.5 m. of previous displacement, and less than 5% of the shots were done requiring displacement of over 4.5 m (Over & O'Donoghue, 2008). However, the displacement quantification has not

been done in padel yet. So the first aim in our study was the quantification of the different movements during padel match.

The quantification of the different shots has been done in the padel only in two recent studies (Almonacid-Cruz, 2011; Corrales et al., 2008). Corrales et al. (2013) analyzed the classification of direct and non-direct shots (the ball bounces on the ground before the shot). They observed, in players with national level, that the shots with higher occurrence are the direct volley (25,57%), the indirect drive (20,16%) the direct backhand (15,57%) and the smash (12,45%) (Corrales et al., 2008). Almonacid-Cruz (2011) performed a quantification reviewing Padel Pro Tour matches (Almonacid-Cruz, 2011). He applied a different classification. His results show that shots from the net were the most common (42.92%) compared to the shots from the wall (24.5%) and backcourt (25.4%) (Almonacid-Cruz, 2011). Within each of these area typologies, Almonacid-Cruz performed the shot qualification of each of them. Regarding shots in the net types, the most frequent were backhand volley (38.8%) and drive volley (31.69%) (Almonacid-Cruz, 2011). Focusing shots in the wall, the most frequent were shots out from the wall with backhand (22.8%) and shots out from the wall with a drive (21.5%) (Almonacid-Cruz, 2011). Finally, centred in backcourt shots, the most frequent were backhand (50.6%) and the drive (44.6%) shots (Almonacid-Cruz, 2011). The different shot classification that used these two studies complicates their comparison. Because of this, in our study we have decided to make a shot quantification similar to Corrales et al. (2013) in order to could do a proper comparison.

The purpose of this study was to perform quantitative analyses of movements and shots in padel in order to establish the importance of each type.

MATERIAL AND METHODS

Participants

Participants participating in the matches were 20 professional elite male players without current injuries or healthy problems. The mean and standard deviation age was 34.2 ± 4.4 years and they had at least a 3 years professional career in padel. Ten participants played in the right side of the court and the other ten in the left.

The participants signed an informed consent form before starting the protocol, in accordance with the Research Commission of the Polytechnic University of Valencia (Spain). All procedures meet the requirements listed in the 1975 Declaration of Helsinki (and its later amendment in 2008) and are in accordance with the ethical standards of the International Journal of Sports Medicine (Harriss & Atkinson, 2009).

Measures

Movements and shots types of the players were both identified, quantified and classified.

Shots classification followed Corrales et al. (2008) classification system. In this system, shots are differentiated in direct and non-direct shots, depending on whether the ball bounces on the wall or ground before the shot, leaving the classification as follows:

- Direct shots: drive, backhand, smash, lob and volley.
- Indirect shots: drive, backhand, smash and lob.

Regarding movements, a custom classification was applied which divides into displacements (lateral, head-on and backward), jumps (split-step and jump for a smash) and turns (pivoting on the right foot and pivoting on the left foot). Each displacement was measured like a unit when started with the start of movement and ended with a stop or change direction. Jumps for a smash were measured beginning with a takeoff of the ground and finishing with a landing, while the split-step was measured when it beginning with a start of movement and ending with a stop the continuous movement.

Procedures

Design of experiments included the planning, development and analysis of ten matches of padel.

After obtaining subject consent, matches were recorded with a video camera (Pulnix, Model RMC-6740CL) set at a sample rate of 100 Hz to allow its posterior analysis by means video analysis software. The video camera was placed in the rear part of the court so all the playing area was covered. Each complete match was recorded and posteriorly analyzed by the same observer.

Analysis

For each type of movement and shot, quantitative treatment consisted in calculating percentages and frequency within periods of 5 min.

All analyses were conducted using a custom made spreadsheet in Excel (Microsoft Inc., USA), and Windows Movie Maker (Microsoft Inc., USA) software was used to visualize the videos of both experiments.

RESULTS

Movements

Lateral displacement (16.1 repetitions every 5 minutes) frequency was predominant, followed by head-on displacement and split-step (13.3 and 7.7 repetitions every 5 minutes respectively) (Table 1). A comparison between pivoting on the right foot and pivoting on the left foot did not indicated large differences (1.07 and 1.36 repetitions every 5 min respectively).

Table 1. Quantitative analyses of the movements in Padel. Frequency every five minutes of the match and movement percentage of the total analyzed matches

	Movements	Frequency every 5 minutes of the match	Percentage of total
Displacements	Lateral	16,14	52,31%
	Head-on	13,36	43,29%
	Backward	1,36	4,40%
	TOTAL		100,00%
Jumps	Split-Step	7,57	72,60%
	Jump for a smash	2,86	27,40%
	TOTAL		100,00%
Turns	Pivoting on the right foot	1,07	44,12%
	Pivoting on the left foot	1,36	55,88%
	TOTAL		100,00%

Shots

Direct volley (24.66%) and indirect lob (20.52%) were the most frequent shots, followed by direct smash (17.76%), indirect backhand (14.70%) and indirect drive (14.55%). Other types of shots have little frequency.

Table 2. Quantitative analyses of the shots in Padel. Frequency every five minutes of the match, shot percentage of the total of the analyzed matches. Data from the study of Corrales et al (Corrales et al., 2008) is included for comparison

Shots		Frequency every 5 minutes of the match	Percentage of total	Corrales et al. (2008)
Drive	Direct	2,00	1,84%	11,80%
	Indirect	15,83	14,55%	20,16%
Backhand	Direct	2,83	2,60%	15,57%
	Indirect	16,00	14,70%	8,36%
Smash	Direct	19,33	17,76%	12,45%
	Indirect	2,50	2,30%	1,31%
Lob	Direct	1,17	1,07%	2,95%
	Indirect	22,33	20,52%	1,80%
Volley	Direct	26,83	24,66%	25,57%
TOTAL			100%	99,97%

DISCUSSION

The analysis of the type and frequency of movements has been performed in previous studies for several sports (Abdelkrim et al., 2007; Bloomfield et al., 2007; Narazaki et al., 2009) This type of study generates essential knowledge to characterize the physical demands of a specific sport (Bloomfield et al., 2007) and also to achieve a complete representation of requirements of play (Buttifant et al., 2001). This knowledge allows to facilitate superior methods of physical and physiological management of players (Bloomfield et al., 2007). However, this kind of knowledge has not been completely covered in padel, existing only some disperse studies analyzing these aspects (Hoyo Lora et al., 2007; Ruiz & Lorenzo, 2008).

The purpose of the present study was to examine the quantification of movements and shots in padel.

Regarding the type of displacements, results show that lateral displacement represents the most executed displacement, followed by head-on displacement and split-step. Thus, and in the same way as in tennis studies (Kovacs, 2009), lateral displacement has a predominance over other movements in padel. Results also show that head-on displacement has a large presence in the padel. This 43% of head-on displacement prevalence in padel compared to the 20% observed by Webber et al. in tennis (Weber et al., 2007) shows a relevant difference between tennis and padel, suggesting a different pattern displacement along the court. Finally, jumps have less frequency in comparison with other movements. However, this frequency must be considered since they have a great importance in joint and muscular injuries (García & Ares, 2007).

The quantification of the shots show the relevant occurrence of direct volley, indirect lob, direct smash, indirect backhand and indirect drive. The precise definition of the most used shots during the game

provides information relevant to plan padel training (Corrales et al., 2008). Corrales et al. (Corrales et al., 2008) reported greater presence of direct shots than indirect shots, and volley was reported as the most used shot. These two reported frequencies coincide with our results, being also volley the most used shot (25,5% of the shots), and presenting direct shots double frequency than indirect shots (68% and 31% respectively).

However, our study also shows that in backhand and lob drive, the indirect shot was quite more present than direct shot. All of these are important differences between Corrales and our study that are showed in Table 2. A possible explanation is the different level of players' skill. Amateur players could be more prone to use the direct drive than other more difficult shots like the direct smash. We suggest this explanation as an extension of what happens in tennis in relation to the displacements, where amateur and professional playing patterns seem to differ. Nigg (1989) showed that the influence of displacements depends on the sport category, and in the case of tennis happens that amateur players performed more walking displacement over others such as running, hopping and jumping (Nigg et al., 1989). Only padel elite players were analyzed in our study so future studies using this methodology are needed in order to know if amateur players shows similar pattern.

CONCLUSIONS

In conclusion, the present study demonstrated the importance in paddle practice for the lateral displacement followed by head-on displacement and split-step, and the greater prevalence of direct volley, indirect lob, direct smash, indirect backhand and indirect drive. The results of this manuscript provided worthy information to improve the design of more specific field tests and training sessions for padel players depending on their skill level.

REFERENCES

Grateful to Spanish Federation of Padel for providing the information of licenses and clubs in Spain to show in this article.

REFERENCES

1. Abdelkrim, N.B., Fazaa, S.E. & Ati, J.E. (2007). Time–motion analysis and physiological data of elite under-19-year-old basketball players during competition. *British Journal of Sports Medicine*, 41(2), pp.69-75
2. Almonacid-Cruz, B. (2011). *Perfil de juego en pádel de alto nivel [Padel game profile in high level]* (Doctoral dissertation). University of Jaen, Jaen, Spain.
3. Bloomfield, J., Polman, R. & O'Donoghue, P. (2007). Physical demands of different positions in FA Premier League soccer. *Journal of Sports Science and Medicine*, 6(1), pp.63-70
4. Buttifant, D., Graham, K. & Cross, K. (2001). Agility and speed in soccer players are two different performance parameters. *Science and football IV*, pp.329
5. Corrales, B.S., De Hoyo, M. & Carrasco, L. (2008). Demandas fisiológicas y características estructurales de la competición en pádel masculino [Physiological demands and structural characteristics of the male padel competition]. *Apunts*, 94, pp.23-28
6. Duffield, R., Reid, M., Baker, J. & Spratford, W. (2010). Accuracy and reliability of GPS devices for measurement of movement patterns in confined spaces for court-based sports. *Journal of Science and Medicine in Sport*, 13(5), pp.523-525

7. García Acedo, D.M. & Ares Bella, F. (2007). Estudio biomecánico y patomecánico en la práctica del pádel [Biomechanical and pathomechanical study and practice of padel]. *Revista Española de podología*, 4, pp.176-183
8. Harriss, D.J. & Atkinson, G. (2009). International Journal of Sports Medicine-ethical standards in sport and exercise science research. *International Journal of Sports Medicine*, 30(10), pp.701-702
9. Hoyo Lora, M., Sañudo Corrales, F.B. & Carrasco Páez, L. (2007). Demandas Fisiológicas de la competición en Pádel [Physiological demands of the male padel competition]. *RICYDE: Revista Internacional de Ciencias del Deporte= International Journal of Sport Science*, 3(8), pp.53-58
10. Kovacs, M.S. (2009). Movement for Tennis: The Importance of Lateral Training. *Strength and Conditioning Journal*, 31(4), pp.77-85.
11. Lasaga Rodríguez., M.J. (2011). *Estudio social y metodológico del Pádel desde la percepción de técnicos y jugadores: una apuesta educativa [Social and methodological study of Padel from the perception of coaches and players: an educational bet]* (Doctoral dissertation). University of Sevilla, Sevilla, Spain.
12. Llana-Belloch, S., Brizuela, G., Pérez-Soriano, P., García-Belenguer, A.C. & Crespo, M. (2013). Supination control increases performance in sideward cutting movements in tennis. *Sports Biomechanics, (ahead-of-print)*, 12(1), pp.38-47
13. Narazaki, K., Berg, K., Stergiou, N. & Chen, B. (2009). Physiological demands of competitive basketball. *Scandinavian Journal of Medicine & Science in Sports*, 19(3), pp.425-432
14. Nigg, B.M., Luethi, S.M. & Bahlsen, H.A. (1989). *The Tennis Shoes. Biomechanical Design Criteria*. (In B. Segesser, W. Pförringer (Eds.), Vol. The Shoe in Sports). London: Wolfe Publishing, Ltd.
15. Over, S. & O'Donoghue, P. (2008). Whats the point—Tennis analysis and why. *ITF Coach Sport Science Review*, 15(45), pp.19-21
16. Ruiz, R. & Lorenzo, O. (2008). Características psicológicas en los jugadores de pádel de alto rendimiento [Psychological characteristics in players of high performance padel]. *Revista iberoamericana de psicología del ejercicio y el deporte*, 3(2), pp.183-199
17. Weber, K., Pieper, S. & Exler, T. (2007). Characteristics and significance of running speed at the Australian Open 2006 for training and injury prevention. *Medicine Science Tennis*, 12(1), pp.14-17