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The behavior of the serve, return of serve, and third action in male young athletes from the Brazilian national padel team

El comportamiento del saque, la devolución del saque y la tercera acción en jóvenes atletas masculinos del Equipo Nacional de Pádel de Brasil

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Abstract. The objective of this study was to investigate the initial actions' behavior in Padel (serve, service return, and third action) among young athletes from the Brazilian national team. The sample consisted of a total of 1547 points from 52 matches, involving 32 athletes from the youth category of the Brazilian male national team. A Chi-square test was conducted to verify associations, along with descriptive analysis of variables related to the serve (first or second serve, direction, and effectiveness), service return (type of shot, direction, and effectiveness), and third action (type of action, effectiveness, and player executing it). The results revealed that most serves were directed towards the glass (50.2%), and service returns were predominantly executed with flat shots towards the net (55.1%) to the player positioned diagonally (53.9%), who predominantly performed the third action through volleys (50.3%) and lobs (28.5%). However, a statistically significant relationship was not found in the studied model. These findings contribute to a more targeted training planning for such competitive demands and provide insights for coaches aiming at the long-term development of youth athletes.
Keywords: Racket sports, game analysis, performance analysis, initial actions, athlete development.

Resumen. El objetivo de este estudio fue investigar el comportamiento de las acciones iniciales del pádel (saque, devolución de saque y tercera acción) en jóvenes atletas de la selección brasileña. La muestra incluyó un total de 1547 puntos de 52 partidos, con la participación de 32 atletas de la categoría juvenil masculina del equipo nacional brasileño. Se realizó una prueba de Chi-cuadrado para verificar las asociaciones y un análisis descriptivo de las variables relacionadas con el saque (primer o segundo saque, dirección y eficacia), la devolución de saque (tipo de golpe, dirección y eficacia) y la tercera acción (tipo de acción, eficacia y jugador que la realiza). Los resultados mostraron que la mayoría de los saques se dirigen hacia el cristal (50,2%) y las devoluciones de saque se realizaron principalmente con golpes planos hacia la red (55,1%) dirigidos al jugador diagonal (53,9%), quien ejecutó la tercera acción predominantemente con voleas (50,3%) y bandejas (28,5%). Sin embargo, no se pudo encontrar una relación estadísticamente significativa según el modelo estudiado. Estos datos contribuyen a un plan de entrenamiento más efectivo para estas demandas competitivas y proporcionan elementos a los entrenadores que buscan la formación a largo plazo de los atletas juveniles.
Palabras clave: Deportes de raqueta, análisis del juego, acciones iniciales, formación de atletas.

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Introduction

Padel is a contemporary racquet sport whose first appearances date back about 50 years, in the city of Acapulco, Mexico (Garcia-Gimenez, Pradas de la Fuente, Castellar Otin, & Carrasco Paez, 2022). Its gameplay is considered dynamic as it is played in doubles on a closed court, with dimensions of 10 x 20 meters, divided into two halves by a net and surrounded by glass and metal screens, which allow for longer rallies due to the possibility of ball rebound (Courel-Ibáñez, Sánchez-Alcaraz, & Cañas, 2015; FIP, 2021). Consequently, its growth, especially in the last decade, has been exponential, and today there are over 70 national federations worldwide (FIP, 2024; Ibáñez, Martínez, Benítez, & Echegaray, 2017).

Due to this popularization, scientific research in Padel has focused on different aspects such as physical and physiological (Courel-Ibáñez, Sánchez-Alcaraz Martinez, & Muñoz Marín, 2019; Díaz-García, González-Ponce, López-Gajardo, Van Cutsem, Roelands & García-Calvo, 2021; Mellado-Arbelo & Baiget, 2022), psychological (Barquín & García, 2008; Escudero-Tena, Galatti, Sánchez-Alcaraz, Muñoz, & Ibáñez, 2023a), tactical-technical actions (Courel-Ibáñez et al., 2019; Sánchez-Álcaraz Martínez, Courel-Ibáñez, & Cañas, 2018a; Ramón-Llin, Guzmán, Martínes-Gallego, Muñoz, Sanchés-Pay, & Sánchez-Alcaraz, 2021a), indicators based on gender, age, and players' level (Courel-Ibáñez et al., 2019), and point duration (Garcia-Gimenez et al., 2022). The research continues to explore the ecological analysis of the game. This field of study provides an understanding of the collective and individual behaviors of athletes in different contexts and under various constraints in the competitive scenario (Garcia-Gimenez et al., 2022; Sánchez-Álcaraz Martínez, Courel Ibáñez, & Cañas, 2018; Sánchez-Álcaraz Martínez, Courel-Ibáñez, et al., 2018a; Sarmento et al., 2022). In relation to the development of padel among young players, research has also focused on assessments of speed, agility, and strength." (Sánchez-Álcaraz, Orozco, Courel-Ibáñez, & Sanchéz-Pay, 2018b).

For example, the serve allows the serving pair to occupy an offensive position near the net from the beginning of the point, which provides spatial advantage when performing the third action (serve is considered the first action, the return the second) compared to the receiving pair, given that 70.6% of service returns in professional Padel are directed

towards players near the net, while 29.4% are performed through the lob (a shot in a parabolic trajectory towards the back of the court). This implies that the receiver of the serve is under pressure to make a correct and efficient return, trying to direct the ball to an appropriate zone, to mitigate such offensive advantage (Ramón-Llin, Guzmán, Llana, Martínez-Gallego, James & Vučković, 2019).

What sets a small group of many athletes apart in the sports arena, parallelly, the reasoning behind the talent identification and selection process lies in the early search for young athletes who fit the standards of the highest-level athletes and who can accumulate adequate training and monitoring hours to surpass previous results (Malina, 2010). However, it is known that the process of achieving sporting success is multifactorial, adding beyond biological, social, and maturational factors, sports diversification, psychological, and well-directed tactical-technical development (Lima, Nascimento, Leonardi, Soares, Paes, Gonçalves, & Carvalho, 2020).

Little is known about the relationship of initial actions in Padel, especially in categories of young athletes. This gap can be filled through a study that gathers information on game analysis aspects with youth categories. So far, investigations seem to focus on aspects of physical training and point duration rather than on tactical-technical training, assisting coaches in planning and developing a training season for young athletes and thus being more assertive and effective in the athlete formation process (García-Benítez, Courel-Ibáñez, Pérez-Bilbao, & Felipe, 2018; Martínez, Ballesta, Ibáñez, & Pay, 2018).

Thus, the present study aims to analyze the direction behavior, type of action performed, effectiveness, and the player executing the serve, service return, and third action among young athletes from the Brazilian Padel national team.

Materials and Methods

Sample

The sample comprised 4641 tactical-technical actions of serve, service return, and third action, derived from 1547 points analyzed from 52 matches conducted during training sessions of male athletes from the Brazilian national youth team aged between 12 to 18 years. The total number of athletes was 32 (30 right-handed and 2 left-handed), with 8 athletes per category (U-12, U-14, U-16 and U-18), with a mean age of 14.47 years (± 2.20), body mass of 63.75 kg (± 14.73), and height of 1.68 m (± 0.12). The training matches analyzed had a duration of 6 games, conducted by the national team coaches. This work was approved by the Ethics Committee of the Federal University of Santa Maria (CAAE: 70787523.8.0000.5346) and had authorization from guardians for image analysis.

Variables

The order of action and the type of action were analyzed according to their occurrence in the game, described as first action (serve), second action (service return), and third action (after the service return, by the serving pair) (Ramón-Llin et al., 2019).

The variables of the first action were: First or Second Serve (FS/SS). Regarding the Service Execution Side, initially, the serve can be performed on the right side (R) or left side (L) of the court, and Service Direction as to where the ball may go towards the side glass (G), the body of the player (B), or center of the court "T" (T - the intersection of the baseline and centerline) (Escudero-Tena, Ibáñez, Parraca, Sánchez-Alcaraz, & Muñoz, 2023b). It is further emphasized that the Service Formation involves the pair of server near the net alternating sides of the court in relation to their partner's serve (Conventional), or consistently remaining on the same side of the court during the serve, regardless of the side from which their partner serves (Australian) (Ramón-Llin et al., 2019; Ramón-Llin et al, 2021a; Ramón-Llin, Guzmán, Martínez-Gallego, Vučković, Muñoz, & Sánchez-Alcaraz, 2021b; Escudero-Tena et al., 2023b; Escudero-Tena, Ibáñez, Vaquer Castillo, Sánchez-Alcaraz, Ramón-Llin & Muñoz, 2023c).

The variables of the second action (service return) were identified based on some Types of Actions within the game. These can be Drive-Forehand (D): Shot executed after the ball bounces, with a horizontal trajectory, on the dominant side. Backhand-Reverse (B): Shot executed after the ball bounces, with a horizontal trajectory, on the non-dominant side. Drive-Forehand with wall (DW): Shot executed on the dominant side after the ball bounces and hits one or more glass panels. Backhand-Reverse with wall (BW): Shot executed on the non-dominant side after the ball bounces and hits one or more glass panels. Lob: Shot in a parabolic arc where the ball becomes higher than the players, can be performed with forehand (LF) or backhand (LB), with or without the use of rebounds on the walls (LFW/LBW). Against the wall: Shot executed with forehand (AW) or backhand (AB) with or without rebounds on the walls, where the player strikes the ball directly on the glass of their court, causing the ball to pass to the opponent's court (Courel-Ibáñez et al., 2019; Sánchez-Alcaraz, Muñoz, Pradas, Ramón-Llin, Cañas & Sánchez-Pay, 2020). Regarding the direction of the shot, it can be classified as parallel - P (where the trajectory of the ball corresponds to the opponent player in the parallel), or diagonal - D (where the trajectory of the ball corresponds to the opponent player in the diagonal) (Escudero-Tena et al., 2023b).

The third action presents the same Types of Actions described above, with the addition of others, such as Volley: A shot executed before the ball bounces, up to head height. It can be performed on the dominant side (forehand/drive - DV) or the non-dominant side (backhand/reverse - BV). Tray (T): Shot executed before the ball bounces, at head height, with a slice effect. Flat Smash (FS): Shot executed before the ball bounces, at the highest possible point, on the dominant side and with the arm extended. Smash x3 meters (S3): Smash with a topspin effect causing the ball to rebound on the back glass and exit through the upper side of the

court. Drive wall exit (DWE): Attack shot similar to a tray but occurs after a high rebound due to the ball bouncing on the floor and on the back glass. Backhand wall exit (BWE): Similar to drive wall exit, it is performed on the non-dominant side of the player (backhand) (Sánchez-Alcaraz et al., 2020).

Player executing the third action: Server or serving pair (S/SP) (Escudero-Tena et al., 2023b). Regarding the depth of the shot, it corresponds to the depth at which the ball impacted the ground or the opponent player's court it hit (Figure 1), with the Attack Zone (AZ) corresponding to the area between the net and the side glass, Transition Zone (TZ) corresponding to the area between the side glass and the baseline, and Defense Zone (DZ) corresponding to the area between the baseline and the back glass (Ramón-Llín Guzmán, Muñoz, Martínez-Gallego, Sánchez-Pay & Sánchez-Alcaraz, 2022).

The Effectiveness of the action was adapted by Ramón-Llín et al. (2022) and analyzed as Negative Continuity - NC (Corresponds to the action that continued the game, but without hindering the opponent's counterattack); Positive Continuity - PC (corresponds to the action that continued the game and hindered the opponent's counterattack); Winner - W (when the point occurs, without the opponent touching the ball); Unforced Error - UE (Corresponds to the action where the athlete committed an error (ending the point), being in favorable conditions to strike the ball); and Forced Error - FE (Corresponds to the shot where the athlete committed an error (ending the point), being in unfavorable conditions to strike the ball).

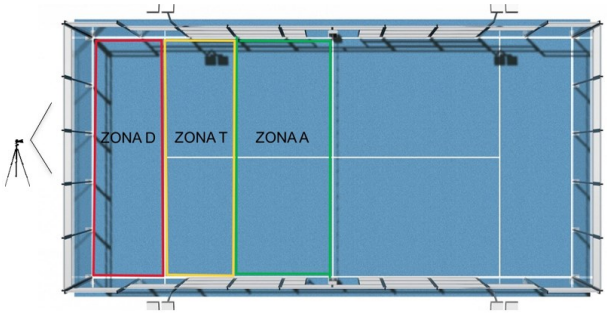

Figure 1. Adaptation of the Padel court into different zones.

Data Collection Procedures

Before data collection, three observers with a minimum of three years of experience working with Padel were trained specifically for this task, led by an expert with over ten years of experience in Padel and game analysis. The training focused on identifying variables and correctly operating the analysis spreadsheet created in Excel® (Microsoft Excel Professional Plus 2021, USA). The analysis spreadsheet was composed of three stages, beginning with the serve, which included information on the serving side, whether it was the first or second serve, the direction of the serve, and its effectiveness. This was followed by the return phase, which contained information on the return technique, the direction of the return, and its effectiveness. Finally, the third action was analyzed, detailing the technique employed, the direction of this third action, its effectiveness, and whether it was executed by the server or the server's partner. The training process lasted 4 weeks, during which all variables were discussed in the meetings, and some games of different matches were jointly analyzed to address some questions before the formal analysis. After training, the observers analyzed the same complete match, consisting of two sets, to calculate inter-observer reliability, obtaining Cohen's Kappa coefficient values between 0.76 and 0.98, values above the 0.75 recommended by the literature (Fleiss, Levin, & Paik, 2013). Data were obtained through video analysis, recorded using smartphones (1080p, 30 frames per second), positioned on tripods approximately 1.5 m away and 2 m high, from the external part of the back of the court to encompass the entire court.

Data Analysis

The data were entered into an ad hoc spreadsheet (Microsoft Excel) containing all study variables. The statistical analysis process was conducted using the IBM SPSS 28.0 statistical package for Macintosh (IBM Corp: Armonk, NY, USA). Descriptive statistics were used to examine the frequencies of categories and emerging events. We performed the Chi-square test (χ^2) with Monte Carlo correction, attempting to verify the association between a) service effectiveness with their respective categories (service side, direction, and player performing the service); b) return effectiveness with their respective categories (technique, return direction); and c) third action effectiveness with their respective categories (technique, return direction). The assumption of analysis of expected frequencies not less than 5 was observed (a maximum acceptable percentage of 20% of cells in this condition was adopted). For significance analysis, an $\alpha = 0.05$ was adopted, and adjusted standardized residuals above $|1.8|$ were analyzed.

Results

The descriptive analysis of variables corresponding to the service indicates that the Service Side occurred 1547 times, with 805 services performed on the right side and 742 on the left side of the court, accounting for 52% and 48% of cases respectively. Of these actions, 1319 (85.3%) corresponded to the first serve, while 228 (14.7%) to the second serve. The service direction toward the opponent's return player revealed that 50% of services were directed at the side glass (n=776), while 25% towards the T or central zone of the court (n=387), and 24.8% towards the player's body (n=384). Regarding effectiveness, 1547 services were analyzed, of which 99.6% indicated Negative Continuity, while 0.4% indicated Positive Continuity, with faulty services excluded from the statistics. Concerning the Service Formation, all pairs during the matches executed the Australian formation, without alternating the sides between the server and the server's partner. The descriptive analysis of variables corresponding to the Service

Return indicates that the most used Return Technique was the Backhand 415 times (26.8%), followed by Backhand Lob with 346 (22.4%), Drive 303 times (19.6%), Drive Lob 224 times (14.5%), below that Backhand Lob with Wall (74 times corresponding to 4.8%), Backhand with Wall (71, 4.6%), Drive with Wall (60, 3.9%), Drive Lob with Wall (49, 3.2%), and Against Wall with Drive (5, 0.3%) accounted for less than 5% of cases. The return direction revealed that 46.1% of returns are directed at the return player's parallel (29.1% in the attack zone, 11.8% in the transition zone, and 5.2% in the opponent's defense zone), while 53.9% of returns are directed diagonally to the return player (25.61% in the attack zone, 21.6% in the transition zone, and 6.7% in the opponent's defense zone). Regarding effectiveness, of the 1547 returns, 1316 were continuous (85.1%), while 132 were errors (8.5%) and 99 were points (6.4%).

The descriptive analysis of variables corresponding to the Third Action indicates that the most used technique was Tray/Víbora 441 times (28.5%), followed by Drive Volley 405 times (26.2%), Backhand Volley 373 times (24.1%), Flat Smash 113 times (7.3%), below that Drive Lob with wall (47 times corresponding to 3%), Drive Wall Exit (42, 2.7%), Drive with wall (28, 1.8%), Drive (27, 1.7%), Backhand Lob with Wall (16, 1%), Backhand and Backhand with Wall (9, 0.6%), Backhand Wall Exit (8, 0.5%), Against Wall with Backhand (2, 0.1%), and Drive Lob (1, 0.1%) accounted for less than 5% of cases. It was observed that 63.2% of actions were directed diagonally (43.2% in the defense zone, 14% in the transition zone, and 6% in the opponent's attack zone), while 29.5% of these actions were directed parallelly (20.8% in the defense zone, 5.2% in the transition zone, and 3.5% in the opponent's attack zone), with 7.3% being errors. Regarding effectiveness, of the 1547 actions, 1316 were continuous (78.7% Negative Continuity and 6.3% Positive), while 132 were errors (6.4%) and 99 were points (6.4%). Specifically, 52.6% of the actions were performed by the server themselves (n=814), while 47.2% by the other player of the pair (n=730).

The Chi-square analysis between Service variables revealed that the Service Side did not show a significant association with Service Effectiveness (χ^2=0.517; df=1, p=0.382), the 1st or 2nd serve did not show a statistically significant association with Service Effectiveness (χ^2=1.041; df=1, p=0.384). Although the Service Direction obtained a significant association with effectiveness (χ^2=11.031; df=2, p=0.009), adjusted standardized residuals could not be interpreted due to the calculation having more than 20% of cells with expected frequency less than 5. Associations related to Service Return, such as Return Technique did not show a significant association with Return Effectiveness (χ^2=2.970; df=9, p=0.893). Although the Return Direction obtained a significant association with effectiveness (χ^2=1388.967; df=18, p<0.001), adjusted standardized residuals could not be interpreted due to the calculation having more than 20% of cells with expected frequency less than 5. Likewise, although the Return Technique obtained significant association with effectiveness (χ^2=302.846; df=45, p<0.001), adjusted standardized residuals cannot be interpreted due to the calculation having more than 20% of cells with expected frequency less than 5.

Discussion and conclusion

The game analysis contributes to detecting indicators during matches that describe athletes' behaviors and provide data to improve training methods (Courel-Ibáñez et al., 2015; Escudero-Tena, et al., 2023b). In this sense, this study aimed to analyze the behavior of direction, type of action performed, effectiveness, and player executing the service, service return, and third action among young athletes from the Brazilian junior paddle team.

Initially, the analysis showed that most services in the junior paddle, in the Brazilian national team category, occurred on the first serve (85.3%), with most directed at the glass (50.2%). Sánchez-Alcaraz et al. (2020) evaluated professional paddle service and found that 92.9% of services hit on the first serve and that 64.6% were directed at the glass. Ramón-Lin et al. (2021a) Analyzed the serve side, direction, and formation of serves in high-level padel, yielding results indicating that 75% of serves were executed to the left side towards the glass in Australian formation, and in Traditional formation, 85% of serves were directed towards the glass on the same side. Fuentes (2019) analyzed adult amateur men and found values similar to ours, with approximately 47% of services directed at the glass. The above-mentioned results show that as the level of play increases, the number of services directed at the glass tends to increase as well. This can be explained because, in addition to accuracy on the first serve, it is interesting to direct the service at the glass to increase the difficulty in making the service return or also to direct it to the "T" to remove it from the returner's base position and start creating movement in the opponent's player and building points (Lupo, Condello, Courel-Ibáñez, Gallo, Conte & Tessitore et al., 2018); Sánchez-Alcaraz, Conde, Genevois, & Muñoz, 2022).

The service return showed a higher frequency of flat shots to the net in its various possibilities (55.1%) compared to lob shots (44.9%), with the direction of the shot predominantly towards the player positioned diagonally (53.9%). Ramón-Llin et al. (2019) observed that in the men's professional adult category, there is a predominance of returns close to the net (70.6%) compared to a lob return (29.4%). These differences in service return may be due to the level of play, where finishing shots from lob returns do not occur as frequently as in the adult professional category (Fuentes, 2019), by the pair returning the service. Moreover, they may also result from the attempt of the pair to return the service to occupy an offensive position close to the net (Ibáñez et al., 2017). Although flat returns are more difficult to execute, they reduce the

chances of the opponent's pair's third action being an aggressive or finishing shot (Sánchez-Alcaraz et al., 2022). However, the service can be answered towards the server's pair in the form of a lob to make this player who is standing still start moving backward, or still, directed at the player who has possession of the service, as they are moving forward to approach the net and this can be exploited to reduce the aggressiveness of the third action (Lupo et al., 2018).

Regarding the third action, a predominance of actions performed before the ball bounces was observed, with Drive and Backhand Volleys being the most frequent (combined, 50.3%) followed by Trays (28.5%), these actions are performed to maintain an offensive position near the net, provided by being the pair with the service (Escudero-Tena, Ibáñez, Vaquer Castillo, et al., 2023). The highest proportion of points in the third action was characterized as continuity (85%), and based on our findings, there seems to be a tendency towards diagonal direction (63.2%). Regarding the player executing the third action, we observed that 52.6% of the actions were performed by the serving athlete, this occurs because the player returning the service tends to direct the ball to this player to hinder their shot, as the player most of the time performs such action in motion (Ramón-Llin et al., 2019). Studying training provides support for coaches, physical trainers, and scientists, among others, to establish better objectives, and improve planning, evaluations, and training, thus aiming at the long-term development of athletes. Future studies should consider analyzing and relating such tactical-technical, physical markers in the junior female category, at different ages and levels of play to quantify and classify each stage of the game more and more.

Although our study model did not indicate statistically significant relationships, we conclude that the analyzed athletes from the Brazilian national team present indicators similar to more advanced categories. A higher number of services directed at the glass to create concerns about the ball rebounding to the glass, backhand return, and backhand lob seeking the non-dominant side of the player, and a tendency for actions performed before the ball bounces, in the attack zone, and by the serving athlete forcing them to approach the net to move them. As study limitations, the analyzed games were played in 6-game sets in training situations proposed by coaches, that is, there is a probability that players had different behaviors when playing with other athletes than their fixed pair, and that athletes had reached a certain level of fatigue due to the concentrated volume of training and matches in a few days.

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