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Analysis of Serve and Serve-Return Strategies in Elite Male and Female Padel

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Abstract: This aim of this study was to analyze serve and return statistics in elite padel players regarding courtside and gender. The sample contained 668 serves and 600 returns of serves from 14 matches (7 male and 7 female) of the 2019 Masters Finals World Padel Tour. Variables pertaining to serve (number, direction, court side and effectiveness), return of serve (direction, height, stroke type and effectiveness) and point outcome were registered through systematic observation. The main results showed that the serving pair had an advantage in rallies, under 8 shots in women and under 12 shots in men. Statistical differences according to gender and court side were found. Female players execute more backhand and cross-court returns and use more lobs than men. On the right court, serves are more frequently aimed at the "T" and more down the line returns are executed when compared to the left side. Such knowledge could be useful to develop appropriate game strategies and to design specific training exercises based on actual competition context.

Keywords: racket sports; performance analysis; game-actions; strokes

1. Introduction

Padel is a racket sport played in pairs (2 vs. 2). The court is characterized by its completely closed girth, as a small-sized grass court (20 × 10 m) surrounded by glass and metallic mesh areas on which the ball can bounce [1]. It has become a mass phenomenon in some countries, such as Spain, and is practiced in more than 35 countries around the world [2]. A professional padel circuit has been created (World Padel Tour), with tournaments in several countries. This development can be attributed to a high interaction between players and a low intensity of actions in a low level of competition [3,4]. Accordingly, the enjoyment and motivation of the players increases, inducing a greater adherence to practice [5–7].

Investigations in padel have increased in the past few years [8]. Research on padel has been mainly focused on describing the match activity and detecting effective performance indicators [9–11]. These investigations have provided primary information such as the rally length (10 to 15 s), the most common actions in offence (volley and smash) and defense (lob), and have highlighted the

advantage of the net game. In addition, padel player performance has been characterized by the ratio between winning shots and errors [12]. Furthermore, previous researches have shown gender-related differences during competition [13,14]. Higher values have been observed in play time and total time in women over men players, as well as in the number and types of strokes [10]. Therefore, the players constantly try to play in offensive positions; for which they use different behaviors and technical-tactical actions, which define different styles of play [12]. The distribution of the different types of strokes, their trajectories and their efficacy stand out among these behaviours [3–5]. The results of the studies have shown that these variables may also differ depending on the gender or the side of the court on which the padel player plays [10,11]. Hence, different performance profiles of padel could exist related to gender and game-side on court [15].

However, there is an alarming lack of investigations examining players' serve and return statistics [16]. One of the most important performance indicators in racket sports is the serve [17]. In tennis, a serve directly wins the point through an ace or indirectly because of the advantage coming from the opponent's imbalance after a great serve [18]. Thus, tennis players win about 70% of points with the first serve, this percentage being higher in men's singles than in women's [17,19]. Previous studies found that serve was more determinant in tennis doubles, likely due to the presence of the server's partner covering the net [20]. Furthermore, the serve situation could influence point or game outcome in padel, since it allows players to adopt an offensive position. In this way, winners scored about 34% more points from the net than losers [9]. However, the serve in padel is different to other racket sports, because of the rules of game. In padel, the ball cannot be beaten as hard as in tennis, and the serve must be an underhand shot from a bouncing ball hit from below waist level. In addition, the effect and the side wall can affect the serve-return shot [16]. The receiver must play an accurate shot to avoid the serving pair hitting the ball into a tactically advantageous area, so they should vary the direction and height of their return of serve [15,16].

A better knowledge of players' behavior when serving or receiving is extremely useful for developing appropriate game strategies and to design specific training exercises [21]. However, at present little is known about the relationship between the serve and return of serve in padel, other than the fact that the server tends to maintain the tactical advantage until around shot five, when the advantage has dissipated [16,22]. In addition, Zhang and Zhou [23] differentiated specific serve tactics in table tennis that were associated with higher scoring rates. Furthermore, some studies highlighted the difference between first and second serves in terms of how aggressive the return could be [24]. Given that serve and return of serve are two of the most important shots in padel, the purpose of this study was to analyze serve and return statistics in elite padel players regarding court side and gender. This information could help coaches to better understand player strategies and their efficiency in padel games.

2. Materials and Methods

2.1. Sample and Variables

The study was reviewed and approved by the Ethical Committee of the University of Murcia. The sample contained 668 serves and 600 returns of serves from 14 professional matches (7 male and 7 female) of the 2019 Finals World Padel Tour. These tournaments gathered the best pairs in the world, ensuring the highest competitive level in all the matches. A total of 32 players, 16 men (mean (SD) age: 31.18 (7.27) years; height: 181.3 (4.1) cm) and 16 women (mean (SD) age: 28.66 (6.7) years; height: 168.4 (3.7) cm) performed the matches. Variables pertaining to serve and return statistics and point outcome were included in the analysis, following the methodology adopted in other similar studies [25]:

- Serve shots were analyzed regarding the serve number (1st and 2nd serve), court side (right and left), serve direction (side wall, middle and T) and effectiveness indicator (winner, error and continuity) (Figure 1).

- Return statistics were analyzed regarding the court side (right and left), stroke direction (down the line, middle and cross court), stroke height (straight and lob), stroke type (forehand and backhand) and effectiveness indicator (winner, error and continuity) (Figure 1).
- Point outcome: strokes were classified according to the winning or losing pair of the point (serving players win and returning players win).
- Total shots: number of total shots in the points were counted.

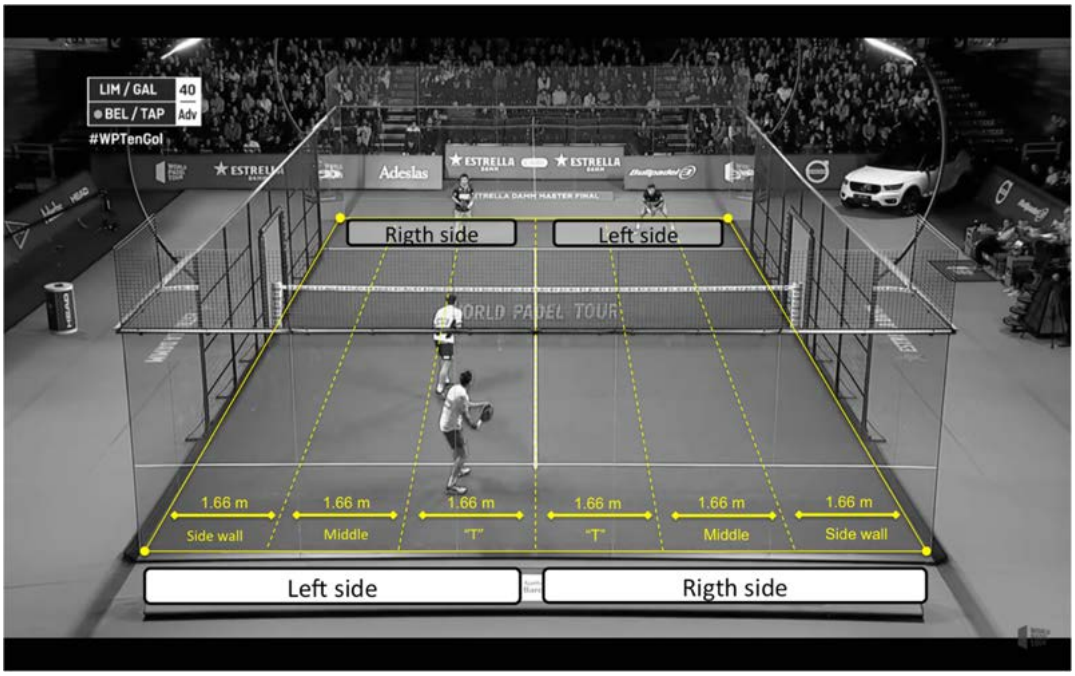

Figure 1. Illustration of court side and serve and return directions.

2.2. Procedure

The matches were downloaded from the official channel of the World Padel Tour [26]. Lince video analysis software was used to collect and register the data [27]. The Kinovea software [28] was used to place a visual grid over the video image for the serve and return directions data recording (Figure 1) and to register the feet of the serving player when impacting the ball, the place where the ball bounced after a successful serve and the direction of the ball after the returner hit it. Four observers specializing in padel (over 5 years of experience) were specifically trained to perform the recording. Observers were specifically trained in the use of the observational instrument for two weeks. The training focused on the clear identification of the variables (serve and return statistics, point outcome and total shots) and the use of the observational instrument software (Lince and Kinovea). Having completed the training process, each observer registered a training set not included in the final sample (n = 72 serves; n = 68 returns), to calculate inter-rater reliability. Consistency of records was analyzed using the free-marginal multirater Kappa [29] and the weighted Kappa [30]. The minimum score obtained was k = 0.87. Finally, intra-observer evaluation was done at the end of the observation process by Cohen's Kappa calculation, yielding a very good strength of agreement with scores over 0.92 [31].

2.3. Data Analysis

Descriptive analysis included means, standard deviations and frequencies. Assumptions of normality and homogeneity of variances were verified using the Kolmogorov–Smirnov test and Levene's test. Due to data not following a normal distribution, non-parametric tests were implemented [32]. Chi square analysis was performed to identify differences in serve and return statistics and point outcome between gender and court side. Column proportions were compared

using Z tests on serve and return statistics according to the gender of the players and court side. A significance level of $p < 0.05$ was established which was adjusted according to Bonferroni in the Z tests. The associations among the categories of the variables were performed with corrected standardized residuals (CSR). The effect size was calculated using Cramer's V [33]. Rho Spearmen was used to know the relationship between serving point won and the number of strokes per point. IBM SPSS 25.0 Statistics for Macintosh (Armonk, NY: IBM Corp.) was used to process the data.

3. Results

3.1. Serve and Return Performances of Professional Padel Players Regarding Gender

Table 1 shows differences in serve and return statistics in relation to players' gender. With regards to serve performance, the players' gender determined the percentage of first and second serves ($\chi^2 = 5.05$; gL = 1; CRS = 2.2; $p < 0.05$). Thus, men obtained a significantly higher percentage of successful first serves than women. Furthermore, both men and women aimed more than 60% of their serves towards the side wall. Regarding return statistics, significant differences between men and women were found with regards to direction ($\chi^2 = 9.647$; gL = 2; CRS = 3.2; $p < 0.01$), height ($\chi^2 = 9.354$; gL = 2; CRS = 2.9; $p < 0.01$) and stroke type ($\chi^2 = 4.230$; gL = 1; CRS = 2.1; $p < 0.05$). Thus, women played a significantly higher proportion of backhand or cross-court returns and used the lob more when returning than men did. Finally, the point-result variable showed how men won a significantly higher percentage of points in a serve situation than women ($\chi^2 = 11.435$; gL = 1; CRS = 3.4; $p < 0.01$).

Table 1. Percentages for the serve and serve–return performances of the professional male and female padel players.

		Male *n* (%)	Female *n* (%)	Sig.
Serve statistics				
Serve Number				
	1st serve	378 (92.9)a	229 (87.7)b	0.025 *
	2nd serve	29 (7.1)a	32 (12.3)b	
Court side				
	Right	211 (51.8)	133 (51.0)	0.823
	Left	196 (48.2)	128 (49.0)	
Serve direction				
	Side wall	263 (64.6)	163 (62.5)	
	Middle	45 (11.1)	19 (7.3)	0.101
	T	99 (24.3)	79 (30.3)	
Effectiveness				
	Winner	0 (0.0)	0 (0.00)	
	Error	36 (8.8)	34 (13.0)	0.085
	Continuity	371 (91.2)	227 (87.0)	
Return statistics				
Stroke direction				
	Down the line	213 (57.4)a	103 (45.0)b	
	Middle	95 (25.6)	69 (30.1)	0.008 **
	Cross court	63 (17.0)a	57 (24.9)b	
Stroke height				
	Straight	242 (65.2)a	122 (53.3)b	0.009 **
	Lob	129 (34.7)a	107 (46.7)b	
Stroke type				
	Forehand	156 (42.0)a	77 (33.6)b	0.040 *
	Backhand	215 (58.0)a	152 (64.4)b	
Effectiveness				
	Winner	0 (0.0)	1 (0.4)	
	Error	20 (5.4)	9 (3.9)	0.323
	Continuity	351 (94.96)	219 (95.6)	
Point outcome				
	Serve pair win	232 (62.5)a	111 (48.5)b	0.001 **
	Returner pair win	139 (37.5)a	118 (51.5)b	

Note: *n* = Number; % = Percentage; * = $p < 0.05$; a, b = significant differences indicated in the Z tests for comparison of column proportions from $p < 0.05$, adjusted according to Bonferroni.

Figure 2 shows the relationship between the percentage of points won by the couple with the serve and the number of strokes per point, in relation to the players' gender. The correlation test results showed a significant relationship for male ($p < 0.001$; $r = 0.62$) and female ($p < 0.001$; $r = 0.54$) players between the percentage of points won in the serve and the number of strokes per point. Thus, the percentage of points won by the player with the serve went down as the number of strokes went up. Furthermore, with regards to gender, serving advantage was lost after the 12th stroke for men, while for women it was after the seventh stroke.

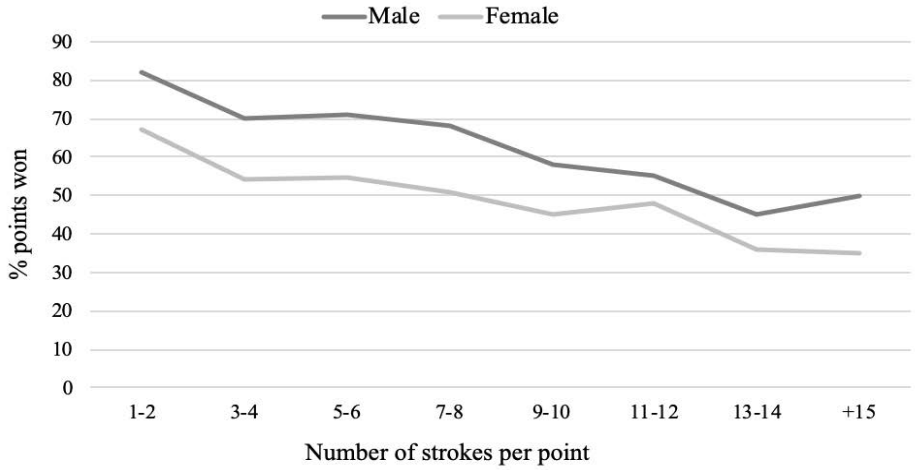

Figure 2. Percentage of points won by the serving couple with relation to the number of strokes per points: gender differences.

3.2. Serve and Return Performances of Professional Padel Players Regarding Court Side

Figure 3 shows serve statistics with regard to court side where said serve was played. As may be observed in the court shown above, court side significantly determined serve direction ($\chi^2 = 18.202$; gL = 2; CRS = 3.3; $p < 0.01$). It may be observed that most serves went towards the side wall, followed by the "T" and, in smaller proportion, the middle of the court. Furthermore, on the left side (ad court) players executed 12% more serves towards the side wall, whereas on the right side (deuce court) players served 14% more towards the "T." On the other hand, no significant differences were found with regards to court side for effectiveness ($\chi^2 = 1.047$; gL = 1; $p > 0.05$) and serve number ($\chi^2 = 2.972$; gL = 1; $p > 0.05$).

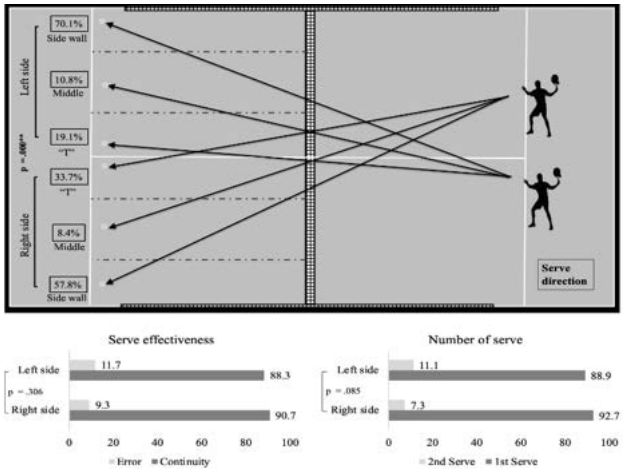

Figure 3. Serve statistics regarding court side.

Figure 4 shows return statistics with regards to the player's side of the court. As may be observed, players executed around 60% of straight returns, with no significant differences regarding court side (χ^2 = 2.048; gL = 2; $p > 0.05$). Furthermore, players obtained a high percentage of return effectiveness, with more than 90% of successful returns, and no difference between the right and left sides (χ^2 = 4.444; gL = 2; CRS = 3.0; $p > 0.05$). Playing side significantly determined the return's direction (χ^2 = 28.711; gL = 2; CRS = 7.6; $p < 0.01$). Thus, players returning from the left side executed almost 15% more down the line returns than players on the right side. Furthermore, the kind of returning stroke also showed significant differences regarding court side. Left side players executed more than 75% of their returns backhand, whereas right side players registered more balanced values, although they did execute more forehand returns. Finally, there were no significant differences between return statistics and stroke type, height or direction ($p < 0.005$).

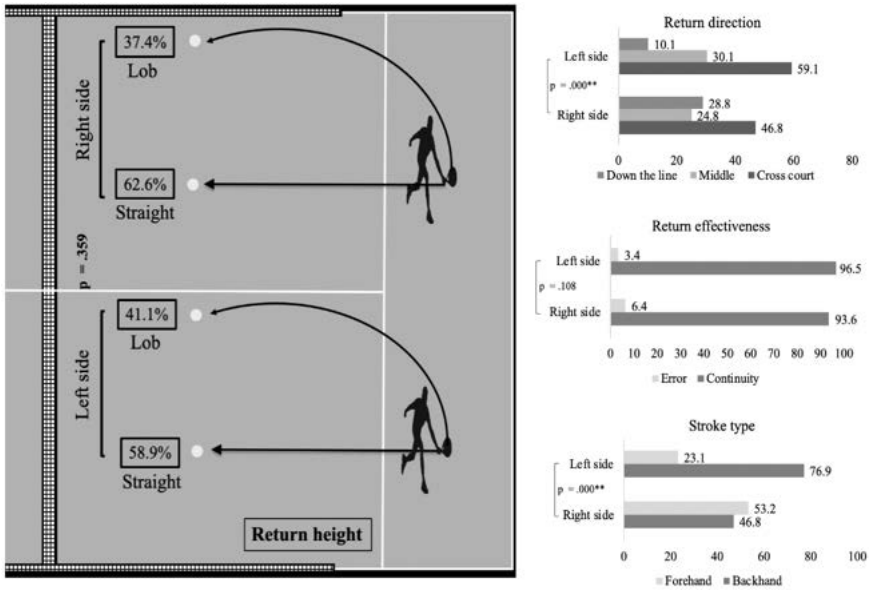

Figure 4. Serve return statistics regarding court side.

4. Discussion

This aim of this study was to evaluate the serve and return statistics in elite padel players regarding courtside and gender. The notational analysis of this research is one of the most important contributions because of the lack of previous research regarding this aspect in padel. The main results showed that the serving pair had a significant advantage in rallies, which lasted until shot 7 in women and shot 12 in men (Figure 2). Considering that serve advantage is lost after the fourth shot in tennis, this finding probably reflects the nature of padel in that it is much harder to play a winning shot, due to the court dimensions and structure, meaning that when a pair is dominating the rally, as at the start of the point when serving, it often takes more shots to finish the rally compared to tennis [16]. Regarding gender, men won a significantly higher percentage of points when serving than women (62.5% vs. 48.5%), as happens in other sports like tennis, where men obtain 14% more points with their serve than their female counterparts [34,35]. These gender differences may be due to the fact that male players are taller and can jump higher, which would enable them to sustain for a longer period of time an offensive position at the net [36,37]. However, deeper analysis and complementary variable collection is encouraged for a more relevant advance in this knowledge. In tennis, previous studies reported that men's serves had an impact on rally outcome in rallies that lasted four shots [22]. This impact of the serve was corroborated by other research, which found that the serving pair won the most rallies containing 1 to 4 shots [38]. These different results in padel suggest that the influence of service extends some way into the rally in padel because the predominance of the "serve and volley" strategy allows the serving pair to move close to the net first and adopt an offensive

position [9,39]. Despite serve advantage being lost when the return players use technical actions that facilitate a change of position, such as lobs, this transition from offensive to defensive position only appears in 37% of points [40]. On the other hand, the results showed first serve effectiveness as being close to 90%. Even though there were no gender significant differences, the higher occurrence of first service faults reported by women could be due to a higher predisposition to obtain a direct point by forcing the first service [15].

With regards to serve direction, the results of this study showed how players served primarily towards the side wall, increasing that percentage on the left side (advantage), which is usually the place where more decisive points are fought. The greater distance covered by the player serving during the point [39] could explain this crossed direction of the serve towards the glass, since it would allow him to buy more time to occupy a better position at the net. Furthermore, the bounce on the side wall may complicate the return stroke, which could cause a greater number of errors, as other authors have claimed [15]. Other studies reported that the high percentage of serves to the side wall on the left side could be explained by the hand-dominance of the players [12]. Thus, since most padel players playing on the left side of the court are right-handed, servers would seek to serve towards the side wall to seek both the backhand of the return as well as the uncertainty of the wall bounce. No differences between genders were found in serve direction. Similar studies in other racket sports, such as tennis, showed that the serve aimed at the "T" was the most effective in winning the point [41]. However, on the left side of the court, better results are obtained when players serve cross-court or open [42]. It is important to highlight that some of these results regarding serve direction could be related more to players' hand dominance than court side [12], so further research is warranted.

The results of this study confirmed that the beginning of each point in professional padel seems very important and decisive for increasing the chances of winning the point. Then, serve effectiveness is directly related to the opponent's serve-return skills [17]. The results showed that a very high percentages of serve returns stayed in (around 90%), but no differences regarding gender or courtside were found. This effectiveness percentage is higher than in other racket sports such as tennis, where serve power is higher [43]. Furthermore, return height and direction in padel may allow couples in the defensive position to execute a stroke that allows them to send the attacking couple to the back of the court [11]. Previous authors showed how sending deep lobs to the corners and close to the walls will keep the rivals far from the net. However, the results of our study showed that players hit about 60% straight and 40% lob shots. These data are confirmed by a previous analysis in a national padel competition, and reflect the importance for the player serving to run toward the net and be able to approach the net to make the straight return more advantageous [16]. Furthermore, the return's height and direction showed significant differences with regards to players' gender and the side of the court. Thus, women executed more lobs and cross-court returns than men. This higher use of lobs by female players has been confirmed in previous studies that suggest a more defensive playing style among women [10,44,45]. Thus, because over-head strokes (smash and tray) are the most successful shots during a match, with a significantly higher percentage in the male category [10,46], players returning the serve have to use the lob only in comfortable positions to overcome their opponents at the net, since a poorly executed lobbed return could have as a response a winning smash from the serving players. At the national level, the lob return of serve achieved long rallies 48.8% of the time for good depth (around 5.5 m beyond the net) off first serves and 61.8% of the time off second serves, and 79.8% of the time for excellent depth (around 8.5 m beyond the net) irrespective of serve [16].

With regards to playing side, players returning the serve on the left side stroke more with their backhand than forehand, and play more straight and down the line strokes than players on the right side, corroborating the findings of Torres-Luque et al. [10], who found that about 75% of serves were directed to the backhand of players. This fact could be due to a higher game aggression of players when resting in the left side, not allowing serving players to take the lead in the point [9,47]. Furthermore, these differences in return with regards to playing side are especially important considering that 75% of the decisive points are played on the left side of the court [35].

Although this is the first study addressing serve and return statistics in professional padel, the study presents some limitations. First, contextual variables such as match status were not registered.

Given the influence of situational variables on game performance [48], it would be very interesting to include such information in future research on padel. On the other hand, other variables that may affect serve and return statistics, such as serve speed or spin and players' hand dominance [12,22,43], have not been taken into account. Finally, the sample was limited, so future studies should analyze a greater number and tournaments and padel players.

5. Conclusions

The current investigation has described the advantage of serving in padel by comparing points won by servers and receiving players after a different number of shots within rallies. Given the server has a significant advantage, the aim of the return is to avoid the serving pair winning the rally quickly. This could be best achieved by good depth on lobs, regardless of the direction, and pace on straight shots, predominately aimed toward the server [16]. Statistical differences according to gender and court side were found. Female players execute more backhand and cross-court returns and use more lobs than men. On the right court, serves are more frequently aimed at the "T" and more down the line returns are executed when compared to the left side. Such knowledge may have implications for accuracy and the quality of training drills based on specific technical–tactical demands.

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