Non-Completed Matches in WTA Tennis (1975-2024): Epidemiology, Trends, and Risk Factors of Walkovers and Defaults

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Abstract

Background:

Walkovers (WOs) and Defaults are significant occurrences in professional tennis, leading to uncompleted matches. WOs typically result from injuries, illnesses, or unforeseen circumstances, while Defaults stem from code of conduct violations. Understanding their epidemiology is essential for optimizing competition structure and injury prevention strategies.

Hypotheses:

The incidence of WOs in Women's Tennis Association (WTA) tournaments increases over time. Both WOs and Defaults are associated with competition-related factors.

Study Design:

Retrospective cohort study.

Level of Evidence:

Level 3.

Methods:

A total of 706,816 singles matches from WTA tournaments between 1975 and 2024 were analyzed. To assess the occurrence of WOs and Defaults, potential associated factors were analyzed using absolute and relative epidemiological measures.

Results:

The overall incidence of WOs was 5.3 per 1000 matches (95% CI, 5.13-5.47), with a slight increase observed in recent years. The WTA Tour recorded the highest incidence (incidence proportion [IP], 5.62; 95% CI, 5.28-5.98). WOs were most frequent in qualifying rounds (IP, 8.09; 95% CI, 7.66-8.55), final rounds (IP, 7.22; 95% CI, 6.75-7.73), and on carpet courts (IP, 7.21; 95% CI, 6.39-8.11). Defaults were extremely rare, with an overall incidence of 0.15 per 1000 matches (95% CI, 0.12-0.18). The highest Default incidence was recorded in qualifying rounds (IP, 0.20; 95% CI, 0.14-0.28) and was most frequent on hard courts (IP, 0.17; 95% CI, 0.13-0.22).

Conclusion:

Competitive structure and playing surface play a role in the occurrence of WOs and Defaults. These findings underscore the importance of injury prevention strategies, fair play policies, and player support systems to minimize disruptions in competition.

Clinical Relevance:

Understanding the epidemiology of WOs and Defaults can help inform injury prevention strategies, optimize tournament formats, and guide policy development to reduce uncompleted matches in the WTA.

Keywords: tennis, walkover, defaults, health, epidemiology

Introduction

Tennis is one of the most widely played sports globally, attracting millions of players, from recreational enthusiasts to elite professionals. A 2024 report by the International Tennis Federation (ITF) estimates that approximately 106 million people play tennis worldwide, with women accounting for 40.3% of players.[2] The sport has been a pioneer in promoting gender equality among professional athletes, achieving significant milestones such as the establishment of the Women's Tennis Association (WTA) in 1973 and the introduction of equal prize money at major international tournaments, including the Grand Slams and the season-ending events of the ATP, WTA, and ITF tours.[12].

This popularity, spanning both professional and amateur levels, speaks to the sport's broad appeal and its physical and mental demands. Unlike many sports, tennis has no fixed duration, with matches continuing until a player reaches the required number of sets or games to win.[5] This open-ended structure, combined with the sport's high-intensity, intermittent nature—characterized by rapid accelerations, decelerations, powerful strokes, and frequent changes of direction and considerable physical and mental strain on players—creates a uniquely challenging environment.[8,21] The increasing density of professional tennis competitions has placed ever-growing physical and psychological demands on players, necessitating exceptional resilience to endure the sport's rigorous schedule. This heightened competitive load, and the game's complex technical and tactical requirements, have led to a notable rise in injury and retirement rates.[3,9,18,19] Adding to these challenges, the variety of court surfaces—primarily hard, clay, grass, and carpet—further impacts the dynamics of the sport. Each surface alters the style and speed

of play, the ball's response, and player biomechanics, creating unique injury patterns and complaints specific to the surface type.[7].

The WTA defines several scenarios in which a tennis match may not be completed. A Walkover (WO) occurs when a player cannot begin a match due to illness, injury, or prematch penalties,[26] while a Default is issued when a player is disqualified for violating the Code of Conduct. Retirements, in contrast, happen midmatch due to illness or injury.[26] Although these situations may share some underlying causes, they differ in their consequences for prize money distribution and ranking points.[26]

Epidemiological studies suggest an increasing trend of incomplete matches, largely attributed to rising injury rates among professional players.[1,17-19] This pattern has been observed across both top-tier and lower-tier circuits.[18,19] While previous research has focused mainly on retirements, little attention has been paid to WOs and Defaults. This gap leaves important aspects of match incompletion unexplored, including implications for players, tournaments, and competitive integrity. The primary aim of this study is to analyze the incidence of WOs and Defaults in professional women's tennis tournaments from 1975 to 2024. Secondary aims are to describe their associated factors and temporal trends, to provide a comprehensive understanding of these noncompleted matches.

Methods

Study design and sample

A retrospective cohort study was designed using a database of all WTA circuit tennis matches between 1975 and 2024 (n = 706,816 matches). The database included professional women's tennis tournaments from 3 categories: ITF Women's World Tennis Tour, WTA 125 Tournaments, and WTA Tour, as detailed in Supplementary Table 1 available in the online version of this article. The database was compiled using the website

GitHub (https://github.com/JeffSackmann/tennis_wta), which gathers information from the official sites of WTA tournaments. The database was reviewed carefully and categorized to determine the circuit in which each match was played, considering the historical context of the events. In addition, the causes of WO and Default were analyzed, with relevant data incorporated from external sources to enhance the accuracy and reliability of the information on these incidents.

Variables

The primary variables are WO (Walkover/No Walkover) and Default (Default/No Default). Variables related to matches, tournaments, and player characteristics in the WTA database are included and displayed in Supplementary Table 2 available in the online version of this article.

Statistical analysis

In the descriptive analysis, absolute (n) and relative (%) frequencies were computed for categorical variables, while measures of central tendency and dispersion were calculated for continuous variables. Therefore, it was not always possible to determine incidence as a rate relative to the number of games played.

Instead, a more feasible approach was to calculate the cumulative incidence or Incidence Proportion (IP) for both WOs and Defaults. This was determined using the formula $IP = e/n$, where e is the number of events (WOs or Defaults) during the study period, and n denotes the total number of exposed matches, expressed per 1,000 matches. For each category of the relevant variables, the number of events, total exposure, IP, and corresponding 95% confidence intervals (95% CI) were reported. The incidence and 95% confidence intervals were estimated using a Poisson distribution.

In addition, following the recommendations of the STROBE statement for observational studies,[24] and the CONSORT statement for randomized controlled trials,[14] relative and absolute measures of association between covariates and the presence of WOs and Defaults were given. They were expressed as cumulative incidence ratio (CIR) and risk differences (RD) with their respective 95% CI. CIR was estimated as the ratio of IP between the 2 specified studied groups (i.e., carpet and clay surfaces). Furthermore, to determine the difference in the number of WOs and Defaults between groups, the RD was calculated as an absolute measure by subtracting the incidence rates (IRs) of the 2 exposure groups. To ensure consistency and facilitate comparison, this study adopted the same methodology used in the analysis of WO in ATP Tournaments.[4]

All analyses were performed using Version 4.1.3 of the R statistical software. The R package compare Groups was used to describe characteristics according to the presence of WO and Defaults.[23] The epi.2by2 function from the R package epiR,[22] was used to calculate the IRs, with the method set to cohort timeasso. The CIR was calculated using the function pois.exact from the epitools package. Most of the graphics were obtained using ggplot2 package.[25] The reproducible code used in this study is openly available in a public GitHub repository (https://github.com/marticasals/WO_Default_WTA), ensuring transparency and facilitating the replicability of the statistical analysis.

Results

Exploratory analysis of WTA matches during the period 1975-2024

A total of 706,816 tennis matches from WTA circuit tournaments between 1975 and 2024 were analyzed. Among these, 73.68% were part of the ITF Women's World Tennis Tour, while 25.36% belonged to the WTA Tour. The majority of matches were played on hard

courts (47.33%) and clay courts (42.71%), followed by carpet courts (5.40%) and grass courts (4.33%). Most matches occurred in preliminary rounds (60.75%) (Table 1).

In terms of match outcomes, 96.93% of matches were completed, while 3.03% were classified as incomplete. Among these, 0.53% ended in WOs, 2.49% resulted in retirements, and only 0.01% were due to Defaults. A small fraction (0.03%) had an unknown outcome (Table 1).

Table 1. Frequency and percentage of matches based on Tournament Level, Surface Type, Set Count, Round, and Match Outcome in WTA Events.

Variable	Category	Frequency	Percent (%)
Tournament Category	ITF Women's World Tennis Tour	520815	73,68
	WTA 125 Tournaments	6768	0,96
	WTA Tour	179233	25,36
Surface	Carpet	38135	5,40
	Clay	301880	42,71
	Grass	30583	4,33
	Hard	334542	47,33
	Unknow	1676	0,24
Round Level	Final Round	116828	16,53
	Preliminary Round	429392	60,75
	Qualifying Round	160596	22,72
Match Outcome	Complete	685150	96,93
	Default	103	0,01
	Retirement	17620	2,49
	Walkover	3746	0,53
	Unknown	197	0,03
		Median [Q1; Q3]	
Age difference		0.2 [-2,9;3,4]	
Difference in ranking positions		-45 [-187;44]	

Descriptive characteristics of Walkovers

The overall IP of WOs in WTA matches across the study period was 5.3 per 1,000 scheduled matches (95% CI: 5.13 – 5.47). Figure 1 illustrates the trend in WO incidence per 1,000 matches from 1975 to 2024. The incidence of WOs in WTA matches was notably high in the early years of the study, peaking at approximately 10 to 12 WO per

1,000 matches in the late 1970s. The incidence then steadily declined throughout the 1980s, stabilizing at approximately 3-5 WOs per 1,000 matches by the late 1990s and early 2000s. However, since 2010, a slight upward trend has emerged, with the incidence rising to about 5-6 WOs per 1,000 matches by 2024 (See Figure 1).

Of the 3,746 matches that ended in a WO, the cause was unknown in 3,349 cases (89.4%). Among the matches with a known cause (n=397, 10.60%), the majority were due to injuries (275 cases; 7.30%), followed by illnesses (80 cases; 2.10%) and other reasons (42 cases; 1.10%). Among the 275 WOs matches attributed to injuries, the distribution was as follows: 52.3% involved the lower limbs, 23.9% the trunk, 22.0% the upper limbs, and 1.9% the head/neck. (See Figure 2) (Table S4 in the Supplemental material).

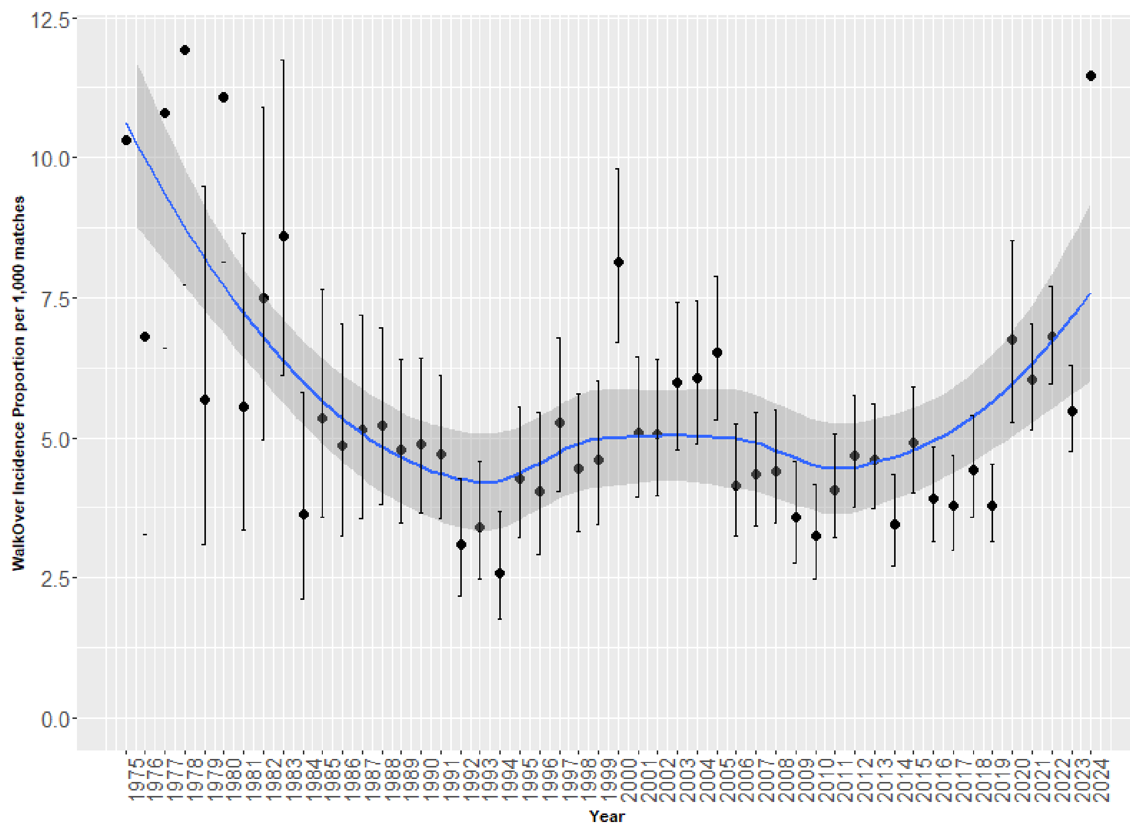

Figure 1. Trends over time in Walkovers incidence per 1,000 Matches in WTA Events (1975–2024).

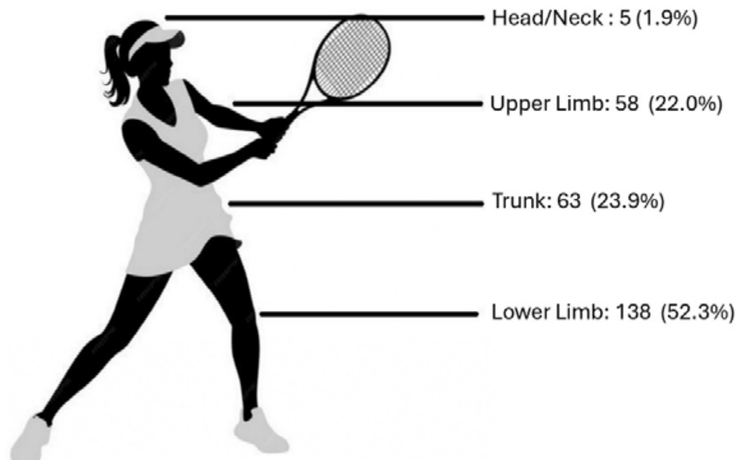

Figure 2. Anatomical areas impacted by injuries leading to Walkovers.

The WTA Tour recorded the highest proportion of WOs at 0.56%, followed by the ITF Women's World Tennis Tour (0.52%) and WTA 125 Tournaments (0.50%). WOs were most common on carpet courts (0.72%) and occurred most frequently in qualifying rounds (0.81%) (Table 2).

Table 2. Match and player characteristics associated with Walkovers and Defaults.

Variable	No WalkOver N=703041	WalkOver N=3746	No Default N=706713	Default N=103
Tournament Category				
ITF Women's World Tennis Tour	518082 (99.5%)	2704 (0.52%)	520743 (100.0%)	72 (0.01%)
WTA 125 Tournaments	6734 (99.5%)	34 (0.50%)	6768 (100%)	0 (0.00%)
WTA Tour	178225 (99.4%)	1008 (0.56%)	179202 (100.0%)	31 (0.02%)
Surface				
Carpet	37859 (99.3%)	275 (0.72%)	38134 (100.0%)	1 (0.00%)
Clay	300294 (99.5%)	1562 (0.52%)	301837 (100.0%)	43 (0.01%)
Grass	30461 (99.6%)	122 (0.40%)	30581 (100.0%)	2 (0.01%)
Hard	332757 (99.5%)	1781 (0.53%)	334485 (100.0%)	57 (0.02%)
Unknown	1670 (99.6%)	6 (0.36%)	1676 (100%)	0 (0.00%)
Round Level				
Final Round	115979 (99.3%)	844 (0.72%)	116807 (100.0%)	21 (0.02%)
Preliminary Round	427787 (99.6%)	1602 (0.37%)	429342 (100.0%)	50 (0.01%)
Qualifying Round	159275 (99.2%)	1300 (0.81%)	160564 (100.0%)	32 (0.02%)
Age difference	0.20 [-2.9; 3.4]	-0.40 [-3.6; 2.6]	0.20 [-2.9; 3.4]	-0.40 [-3.8; 3.8]
Ranking difference	-45.00 [-187; 43]	7.00 [-101; 119]	-45.00 [-187; 44]	9.00 [-72; 72]

Epidemiological measures of Walkovers

Among tournament categories, the WTA Tour recorded the highest IP at 5.62 per 1000 matches (95% CI: 5.28–5.98), with a CIR of 1.08 (95% CI: 1.01–1.16) compared to the ITF Women's World Tennis Tour (IP: 5.19; 95% CI: 5–5.39). Walkovers were most frequent on carpet courts (IP: 7.21; 95% CI: 6.39–8.11), significantly higher than on hard courts (IP: 5.32%; 95% CI: 5.08–5.58) and grass courts (IP: 3.96; 95% CI: 3.29–4.73) (Table 3).

When analysing match rounds, the qualifying rounds had the highest IP (IP: 8.09; 95% CI: 7.66-8.55), followed by final rounds (IP: 7.22; 95% CI: 6.75-7.73) and preliminary rounds (IP: 3.73; 95% CI: 3.55–3.92). Compared to preliminary rounds, final rounds had a significantly higher CIR of 1.94 (95% CI: 1.78–2.11), with an RD of 3.49 (95% CI: 2.97–4.01), while qualifying rounds had a CIR of 2.17 (95% CI: 2.02–2.34) and an RD of 4.36 (95% CI: 3.89–4.84) (Table 3).

Table 3. Incidence proportion (IP), cumulative incidence rate (CIR), risk difference (RD), and 95% confidence interval (95% CI) of Walkovers (WOs) in professional tennis matches, analysed by tournament level, surface type and round.

Variable	Walkover	Matches	IP (95% CI)	CIR (95% CI)	RD (95% CI)
Tournament Category					
ITF Women's	2704	520815	5.19 (5 - 5.39)	1	0
WTA 125 Tournaments	34	6768	5.02 (3.48 - 7.01)	0.97 (0.67 - 1.36)	-0.17 (-1.87 - 1.53)
WTA Tour	1008	179233	5.62 (5.28 - 5.98)	1.08 (1.01 - 1.16)	0.43 (0.03 - 0.83)
Surface					
Hard	1781	334542	5.32 (5.08 - 5.58)	1	0
Carpet	275	38135	7.21 (6.39 - 8.11)	1.35 (1.19 - 1.54)	1.89 (1 - 2.77)
Clay	1562	301880	5.17 (4.92 - 5.44)	0.97 (0.91 - 1.04)	-0.15 (-0.51 - 0.21)
Grass	122	30583	3.96 (3.29 - 4.73)	0.75 (0.62 - 0.9)	-1.33 (-2.08 - -0.58)
Round Level					
Preliminary Round	1602	429392	3.73 (3.55 - 3.92)	1	0
Final Round	844	116828	7.22 (6.75 - 7.73)	1.94 (1.78 - 2.11)	3.49 (2.97 - 4.01)
Qualifying Round	1300	160596	8.09 (7.66 - 8.55)	2.17 (2.02 - 2.34)	4.36 (3.89 - 4.84)

Descriptive characteristics of Defaults

A total of 103 Defaults were recorded, accounting for 0.01% of all matches analysed. The IP was 0.15 per 1,000 matches (95% CI: 0.12–0.18). Of these, 72 cases (0.01%) occurred in the ITF Women's World Tennis Tour, while 31 cases (0.02%) were recorded in WTA Tour events. No Defaults were recorded in WTA 125 Tournaments during the study period. Defaults were most frequent on hard courts (57 cases, 0.02%), followed by clay courts (43 cases,0.01%). They were most common in qualifying rounds (32 cases, 0.02%), followed by final rounds (21 cases, 0.02%) (Table 2).

Among matches that ended in a Default, the cause was unknown in 87 cases (83.7%) due to a lack of reporting. For the 16 matches (15.5%) with a known cause, the majority were due to ball abuse (5 cases; 4.8%), followed by verbal abuse (4 cases; 3.8%) and racquet abuse (4 cases; 3.8%). Defaults occurred almost equally before the match (50 cases; 48.5%) and during the match (53 cases; 51.5%) (Table S4 in the Supplemental material).

Epidemiological measures of Default

Among tournament categories, the WTA Tour recorded an IP of 0.17 per 1000 matches (95% CI: 0.12–0.25), with a CIR of 1.25 (95% CI: 0.79–1.93) and an RD of 0.03 (95% CI: -0.03-0.1) compared to the ITF Women’s World Tennis Tour. Defaults were most frequent on hard courts, with an IP of 0.17 per 1,000 matches (95% CI: 0.13–0.22), which served as the reference surface. Clay courts had a slightly lower IP of 0.14 (95% CI: 0.10–0.19), with a CIR of 0.84 (95% CI: 0.55–1.26) and an RD of -0.03 (95% CI: -0.09 to 0.03) relative to hard courts. Grass courts had the lowest IP of 0.07 (95% CI: 0.01–0.24), with a CIR of 0.38 (95% CI: 0.05–1.45) and an RD of -0.10 (95% CI: -0.21 to 0) (Table 4).

When analysing match rounds, qualifying rounds had the highest IP (IP: 0.20; 95% CI: 0.14–0.28), followed by final rounds (IP: 0.18; 95% CI: 0.11–0.27). Compared to

preliminary rounds, qualifying rounds had a CIR of 1.71 (95% CI: 1.06–2.72) and an RD of 0.08 (95% CI: 0.01–0.16).

Table 4. Incidence proportion (IP), cumulative incidence rate (CIR), risk difference (RD), and 95% confidence interval (95% CI) of Default in professional tennis matches, analysed by tournament level, surface type and round.

Variable	Default	Matches	IP (95% CI)	CIR (95% CI)	RD (95% CI)
Tournament Category					
ITF Women's	72	520815	0.14 (0.11 - 0.17)	1	0
WTA 125 Tournaments	0	6768	0 (0 - 0.54)	-	-0.14 (-0.17 - -0.11)
WTA Tour	31	179233	0.17 (0.12 - 0.25)	1.25 (0.79 - 1.93)	0.03 (-0.03 - 0.1)
Surface					
Hard	57	334542	0.17 (0.13 - 0.22)	1	0
Carpet	1	38135	0.03 (0 - 0.15)	0.15 (0 - 0.89)	-0.14 (-0.21 - -0.08)
Clay	43	301880	0.14 (0.1 - 0.19)	0.84 (0.55 - 1.26)	-0.03 (-0.09 - 0.03)
Grass	2	30583	0.07 (0.01 - 0.24)	0.38 (0.05 - 1.45)	-0.1 (-0.21 - 0)
Round Level					
Preliminary Round	50	429392	0.12 (0.09 - 0.15)	1	0
Final Round	21	116828	0.18 (0.11 - 0.27)	1.54 (0.88 - 2.62)	0.06 (-0.02 - 0.15)
Qualifying Round	32	160596	0.2 (0.14 - 0.28)	1.71 (1.06 - 2.72)	0.08 (0.01 - 0.16)

Discussion

This study aimed to provide a comprehensive epidemiological analysis of WOs and Defaults in professional women's tennis tournaments (ITF Women's World Tennis Tour, WTA 125 Tournaments, and WTA Tour), covering a period of 49 years (1975 to 2024). During the study period, the overall incidence of WO in WTA and ITF tournaments was 5.3 per 1000 scheduled matches (95% CI, 5.13-5.47), indicating that WOs are a relatively rare occurrence in professional women's tennis. In the primary WTA Tour, the incidence was slightly higher at 5.52 per 1000 matches (95% CI, 5.28-5.98). In comparison, the ATP primary circuit reported a lower overall WO incidence of 4.2 per 1000 matches (95% CI, 3.9-4.5).[4] At the lower-tier levels, the WTA 125 Tournaments recorded the lowest WO incidence at 5.02 per 1000 matches (95% CI, 3.48-7.01), while the ITF Women's

World Tennis Tour had an IP of 5.19 per 1000 matches (95% CI, 5.00-5.39). The relatively higher incidence of WOs observed in top-tier competitions (WTA Tour) compared with ITF and WTA 125 events may be related to the greater physical demands of these tournaments, which may discourage players from starting a match if they feel unable to compete at their peak performance. In addition, the higher stakes and intense competition in the WTA Tour events may prompt players to withdraw pre-emptively to avoid worsening an injury, ultimately contributing to a higher WO incidence in these tournaments. When comparing retirement IRs across competition levels, the WTA Tour showed a lower retirement IR of 0.81 per 1000 games (95% CI, 0.7-0.88) compared with higher rates in the ITF Women's World Tennis Tour (IR, 1.36; 95% CI, 1.33-1.39) and WTA 125 Tournaments (IR, 1.38; 95% CI, 0.77-2.28).[18,19] Across all levels of competition, retirements occur more frequently than WOs. This trend can be attributed to players tendency to start matches despite physical limitations, particularly in lower-tier events, where financial incentives and ranking points provide strong motivation to compete. As a result, players may push through injury or physical strain, leading to a higher likelihood of in-match retirements.

Among the remaining 10.6% of matches with identified causes, injuries accounted for the majority (7.3%, 275 matches), followed by illnesses (2.1%, 80 matches) and other reasons (1.1%, 42 matches). Lower limb injuries were the most reported, comprising 52.3% of injury-related WO. These findings align with previous studies that underscore the predominance of lower-limb injuries in noncompleted matches. For example, Casals et al[3] observed that lower-extremity injuries accounted for 63% of retirements in Davis Cup matches, with muscles and tendons particularly vulnerable (53.70%). Similarly, Dakic et al[6] reported a comparable injury profile in WTA players, with lower-limb injuries being the most prevalent (41.3 per 1000 exposures; 95% CI, 28.6-54.0). Collectively, these

findings reinforce the critical role of musculoskeletal injuries, particularly in the lower extremities, as a predominant factor in WOs and retirements in professional tennis, highlighting the need for targeted injury prevention strategies.

In our study, WOs were most common on carpet courts, with an IP of 7.21 per 1000 matches (95% CI, 6.39-8.11). In contrast, grass courts had the lowest incidence at 3.96 per 1000 matches (95% CI, 3.29-4.73). These trends are consistent with findings from the ATP circuit, where carpet surfaces also reported the highest WO incidence (IP, 6.29; 95% CI, 5.17-7.57).[4] It is important to note that WO is a type of retirement that occurs before a match starts, differing from in-match retirements, and can be influenced by factors such as surface type. Several studies have examined the impact of playing surfaces on injury risk, reporting notable findings. Previous research has shown that surface type significantly affects injury rates, with higher injury incidence observed on clay courts in professional players,[1,10] while hard courts are associated with the majority of injuries at the junior and amateur levels.[11,16] These findings highlight the significant role of playing surfaces in injury risk and stress the importance of surface-specific injury prevention strategies in professional tennis.

In WTA tournaments, qualifying rounds had a notably high WO incidence of 8.09 per 1000 matches (95% CI, 7.66-8.55), compared with 3.73 per 1000 matches (95% CI, 3.55-3.92) in preliminary rounds. In addition, final rounds recorded one of the highest WO incidence, with an IP of 7.22 per 1000 matches (95% CI, 6.75-7.73). This pattern aligns with findings from the ATP Tour, where final rounds also had a high WO incidence (IP, 7.53; 95% CI, 6.50-8.68).[4] Similar to the ATP, fatigue and accumulated physical stress throughout a tournament may contribute to the increased likelihood of WO in later rounds. Previous research on match retirements in tennis support this trend. For example, in the Davis Cup, retirements peaked in the fourth match, with an IR of 1.54 per 1000

matches (95% CI, 1.15-2.02) and an incidence rate ratio (IRR) of 2.10 compared with the first match, suggesting that fatigue progressively increases as the tournament advances.[3] Similarly, Jayanthi et al[13] observed a sharp rise in medical retirements in junior tournaments after the fourth match, with the incidence increasing from 6.3 to 16.7 per 1000 exposures.

A few Default cases were recorded in the WTA, with an IP of 0.135 per 1000 matches (95% CI, 0.12-0.18). In the ITF Women's World Tennis Tour, 72 cases were reported, accounting for 0.01% of matches, while the WTA Tour recorded 31 cases (0.02%). A study on lower-tier ATP and WTA circuits reported 235 Default cases (0.04%) in the ATP and 33 cases (0.01%) in the WTA. This suggests that Defaults are relatively rare in WTA tournaments compared with ATP events.[19] This sex difference in Default incidence could be related to psychosocial and emotional regulation factors, as suggested in previous studies. Women have been described as showing stronger social adjustment, characterized by higher levels of tolerance, flexibility, discipline, and sociability, which may reduce the likelihood of unsportsmanlike behavior leading to disqualification.[20] Conversely, men have been reported to externalize anger more frequently, through actions such as shouting, racquet abuse, or verbal aggression,[15] behaviors that can increase the risk of a Default. In contrast, women tend to internalize anger using strategies such as suppression or refocusing attention,[15] which may help them avoid disqualification. However, given the small number of Defaults observed in our study and the limited number of available studies on this topic, these explanations remain speculative and should be interpreted with caution.

This study's findings have important implications for tournament organisers, coaches, and players. Organisers should optimise schedules to allow adequate rest between matches and manage the demands of different surfaces to minimise physical stress. Athletes need

tailored strategies for physical preparation and injury management based on surface type and tournament stages to maintain performance and reduce the risk of WO.

Several limitations need to be considered when interpreting the results of this study. Detailed data on the specific causes of many WOs and Defaults were unavailable, and reliance on secondary records may have introduced inconsistencies or missing information. These limitations underscore the need for future studies to collect more granular data to gain deeper insights into the factors driving withdrawals in professional tennis.

This study provides a comprehensive analysis of WOs and Defaults in professional women's tennis between 1975 and 2024. WOs were infrequent but more common in higher-level tournaments, in qualifying and final rounds, and on carpet courts, with injuries being the reason reported most frequently. Defaults were exceedingly rare and linked mainly to code of conduct violations. Overall, these results describe the incidence and distribution of noncompleted matches across nearly 5 decades of professional women's tennis.

These findings provide valuable insights into the patterns and trends of match WOs and Defaults in professional women's tennis, highlighting the need for injury prevention strategies, fair play policies, and player support systems to minimize disruptions in competition. However, given the large amount of missing information on causes, they should be interpreted with caution.

Disclosure statement

The authors report no competing interests to declare.

Ethics statement

No ethical approval was needed for this research, as all the information used and reported for analysis is freely available online.

Acknowledgments

We would like to thank Alberto Ameijide Sanchez for his contribution to the initial data extraction for some of the years covered in the study and his support with the early exploratory analyses. This work has been supported by the Ministerio de Ciencia e Innovación y Universidades (Spain) [PID2023-148033OB-C21], and by grant 2021 SGR 01421 (GRBIO) administrated by the Departament de Recerca i Universitats de la Generalitat de Catalunya (Spain).

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