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Citation:

Gasparetto, T and Dietl, H and Nessler, C and Muñiz, C (2023) When a woman replaces a man: evaluating coach dismissal in professional tennis. *Managing Sport and Leisure*. pp. 1-16. ISSN 2375-0472 DOI: <https://doi.org/10.1080/23750472.2023.2235363>

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Document Version:

Article (Published Version)

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# When a woman replaces a man: evaluating coach dismissal in professional tennis

Thadeu Gasparetto <sup>a</sup>, Helmut Dietl <sup>b</sup>, Cornel Nesseler <sup>c</sup> and Cristina Muñiz <sup>d,e</sup>

<sup>a</sup>Carnegie School of Sport, Leeds Beckett University, Leeds, UK; <sup>b</sup>University of Zurich, Zurich, Switzerland; <sup>c</sup>Department of Social Sciences, University of Stavanger, Stavanger, Norway; <sup>d</sup>University of Oviedo, Oviedo, Spain; <sup>e</sup>Norwegian University of Science and Technology, Trondheim, Norway

## ABSTRACT

**Purpose:** Previous research indicates gender discrimination in leadership positions. However, performance and not gender should be the key indicator when evaluating a leader. We examine the performance effect of changing from a female to a male coach and vice versa.

**Methodology:** We analyze 1,093 Billie Jean King Cup singles matches from 2006 to 2016, with the match result as the dependent variable. First, we examine the very short-term effects arising from the change of a coach with a regression discontinuity design. Second, we evaluate the short-, medium-, and long-term performances.

**Findings:** The results show that the gender of the new coach has no significant effect on performance. However, when a female coach succeeds another female coach, performance improves. This provides an argument in favor of female leadership.

**Practical Implications:** Team managers should primarily focus on the quality of the coach instead of gender. The results also suggest that a continuum of female leadership is likely advantageous.

**Research Contribution:** This paper contributes to the debate regarding the misrepresentation of women as head coaches and offers an avenue for further research.

## ARTICLE HISTORY

Received 26 October 2021

Accepted 7 July 2023

## KEYWORDS



Coach; dismissal; performance; gender; turnover

## Introduction

Female athletes account for a large pool of potential leaders and coaches in sport (Schull, 2017). Leadership positions in sports, however, are predominantly male-dominated (Darvin et al., 2018; Fielding-Lloyd & Meân, 2011; Grapendorf & Burton, 2017; Leberman & Burton, 2017). While sports participation is becoming more gender-balanced, women remain significantly under-represented in high-performance

coaching positions (Massengale & Lough, 2010; Smith & Wrynn, 2013). For example, Norman (2014) shows that less than 25% of coaches in all sports are women. Additionally, elite national teams rarely recruit women. Women are, therefore, rarely found in leading positions in women's sports and are practically absent in men's sports (Walker & Sartore-Baldwin, 2013).

Though gender equality has gained momentum in the last decades, there remains an

**CONTACT** Thadeu Gasparetto  t.miranda-gasparetto@leedsbeckett.ac.uk  Carnegie School of Sport, Leeds Beckett University, Headingley Campus, LS6 3QQ, Leeds, UK

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overall unequal representation of women in leadership positions (Powell, 2018). Therefore, it is evident that further actions should be pursued, with policy interventions being central. Consequently, The European Commission presented the Gender Equality Strategy 2020-2025 (European Commission, 2020), aiming at the promotion of gender equality and the empowerment of women worldwide as well as building a stereotype-free society.

Sports are understood to exist within a gendered space with barriers for women (Norman, 2016). Though sexism in societies is increasingly present in subtle forms, sports constitute a particular sector in society regarding the treatment of women because sexism “is so entwined in the fabric of sport that most people do not even discern it” (Fink, 2016, p. 2). More action is therefore required within sports. Bodies such as the United Nations recognize that sport is an important context for enhancing gender equality (United Nations Women, 2016). The United Nations recognized the power of sports to contribute to sustainable development as part of the Goals of the 2030 Agenda (United Nations, 2018). Gender equality, in particular, is goal number 5 (United Nations, n.a.).

There are expectations about the roles that men and women play in society according to social role theory (Eagly & Wood, 2012). Beliefs from the perspective that “women take care and men take charge” (Hoyt & Burnette, 2013, p. 1307) influence leadership opportunities for women. Because men have historically dominated sports, it is more challenging for sporting organizations to shift and align with gender equality (Cunningham, 2008). Many sports organizations remain strongly male-dominated, which preserves male hegemony. Masculinity, thus, becomes the status quo in sport, and men continue to enjoy privileges. Consequently, sport has assumed a masculine identity and is understood to be synonymous with masculinity. This stereotype led to a “think manager-think

male” association (Ryan & Haslam, 2005, 2007), resulting in sports becoming a patriarchy (Norman & Rankin-Wright, 2018) where men are the norm, while women are considered as “other” (LaVoi, 2007).

The attribution of gendered competencies to the leadership role (Ahn & Cunningham, 2020) leads to an expectation of underperformance when women play a leading role in sport (Heilman, 2001; Heilman & Caleo, 2018). That is, feminine traits are considered to exhibit a poor link to leadership roles (Ahn & Cunningham, 2020). Therefore, the existence of gender stereotypes drives the discrimination of females in sport as it is more challenging for women to access a leadership role and succeed (Wicker et al., 2019).

The possibility of performance enhancements is an important reason for companies and organizations to consider replacing leading personnel. Leadership should, however, not be based on subjective beliefs about the role of gender, but on objective measures of the coach’s performance (Darvin et al., 2018). Although research suggests that poor performance is central to the dismissal of a coach (Foreman et al., 2019), there is sparse literature that examined whether the gender of the coach has an impact on dismissal (see e.g. Wicker et al., 2019).

Dawley et al. (2004) note that further research is required that focuses on the role of gender in coaching changes. The present study, therefore, raises an important research question: Does the gender of a new coach significantly impact the outcome of a match? This study is an essential contribution as the major shortcoming of previous work in this area is that the focus is primarily on cases when the predecessor and successor are males. The similarity-attraction paradigm argues that similar personal traits between individuals link positively to their mutual attraction (see Byrne, 1971). Wells and Aicher (2013) propose that a congruence between the coach’s gender and the team’s gender can positively influence several factors, including

leadership endorsement, communication, role expectations, team cohesion, attachment, leadership effectiveness, and ultimately, the team's overall performance. Moreover, Aicher and Sagas (2010) found that gender similarity has an influence on the performance of female sports teams. These insights highlight the potential significance of coach gender when aiming to optimize performance within women's sports.

Another contribution of the present study is that it analyzes the importance of timing coach changes. According to Rowe et al. (2005) and Dohrn et al. (2015), timing plays an important role when changing leaders and coaches, respectively. Furthermore, Giambatista et al. (2005) recommend extending the performance analysis period beyond a short-term perspective. Thus, we focus on the performance impact in the very short, the match played subsequent to the coach's turnover-, short-, medium-, and long-term. Performance often improves when the coach is given 'sufficient time' (Soebbing & Washington, 2011, p. 559).

Our paper contributes to a better understanding of the impact of coach changes on performance, including the mediating role that the gender of the old and new coach plays. While coach changes may have a positive, negative or no effect, it is expected that a gender congruence between coach and players has a positive effect on the team's performance because female coaches are more likely to understand the needs of a female team (Wells & Aicher, 2013).

We use data from 2006-2016 from the professional national female tennis competition (Billie Jean King Cup – previously called Federations Cup) because female coaches comprise a relatively large share compared to other sports leagues. For the very-short term analysis, i.e., one match after the predecessor, we apply a regression discontinuity design (RDD). For the short-, medium-, and long-term analysis, we use a Linear Probability Model. The short-term analysis includes matches 2-5, medium-term

includes matches 6-10, and long-term includes matches 11-20.

## Theoretical framework

### *Stereotypes, glass ceiling and discrimination*

Although previous literature notes that female leadership role models are central to sports (Acosta & Carpenter, 2008), it remains unclear why females do not have equal coaching opportunities (LaVoi & Baeth, 2018). While female sports leaders encourage other women in their career choices (Massengale & Lough, 2010), the paucity of female role models in coaching raises uncertainty for female athletes in terms of their prospective professional opportunities (Rhode & Walker, 2008).

The glass ceiling theory pioneered by Ryan and Haslam (2005) prompted a growing literature that illustrated the precariousness of women in leadership positions (Ryan et al., 2016). According to this theory, even if women have the same qualifications, they are less likely to become leaders because they are exposed to greater scrutiny causing women to be assessed more poorly (Burton et al., 2011; Ryan et al., 2011; Ryan & Haslam, 2007). Furthermore, the theory states that women are more likely to be in leadership positions when the team has a more precarious status and, subsequently, is at greater risk of failure. This fuels the belief that women are not skilled to succeed in a leadership role (Brescoll et al., 2010), resulting in self-limiting behavior where women do not pursue a promotion because of the expectation of failure (Sartore & Cunningham, 2007).

Gupta et al.'s (2020) research supports the glass ceiling approach. Their findings suggest that the dismissal of female CEOs is less sensitive to performance measures and that female CEOs are more likely to be pressured into leaving their role. In the context of women's college football, Wicker et al. (2019) note that women coaches are more likely to be recruited

when the team is in crisis, i.e., they are appointed to a leadership position when it is precarious. Hovden (2010), who analyzes the attitudes of board members of Norwegian sports federations towards gender roles, shows that women are prevented from entering leadership roles because of negative stereotypes.

The glass ceiling theory is closely aligned with the socially widespread accepted stereotype that men are physically superior and more powerful than women (Sartore & Cunningham, 2007; Peachey & Burton, 2011). The role congruity theory focuses on these prejudices against women. This theoretical approach argues that leadership positions are particularly challenging for women as there is a perception of the incongruity between the leadership role and the gender role (Eagly & Karau, 2002).

These gender stereotypes and role incongruities have led to discrimination against women in sports leadership (Wicker et al., 2019). More specifically, the research identified two forms of discrimination against women in sport: access discrimination and treatment discrimination (Cunningham & Sagas, 2007). Access discrimination arises when individuals belonging to specific groups are precluded from access to an organization (Greenhaus et al., 1990). Treatment discrimination, on the other hand, exists whenever individuals of particular groups are provided with fewer resources by their organization than they deserve. Minority groups in sports usually face both types of discrimination (Sartore & Cunningham, 2007).

Our research examines to what extent the gender of the incoming coach influences performance. Gomez-Gonzalez et al. (2019) report that the gender of the coach is not a relevant driver of team performance in professional women's soccer. Our research is helpful in overcoming discrimination against women in leadership since, as previous literature has suggested, there are currently more covert forms of discrimination than in the past.

Consequently, discrimination is now more difficult to identify (Moran-Miller & Flores, 2011).

There would be no basis for justifying male over-representation in sports coaching if the gender of the coach is not a determinant of performance and the aspirations of female athletes to become coaches would increase (Moran-Miller & Flores, 2011). Hiring coaches in accordance with their performance and other quantifiable criteria can contribute to recognizing women in sport as leaders. More women in leadership roles are necessary, according to critical mass theory, which argues that a critical mass is necessary for a subgroup to become more influential in decision-making (Wicker & Kerwin, 2022).

### ***Leadership succession theory***

In addition to examining the impact of the gender of the incoming coach on the outcome of singles matches, we focus on the time component. It is reasonable that time needs to elapse before the impact of a new coach becomes apparent (Holmes, 2011). Our research analyzes both the immediate effects on the match outcome of the coaching turnover as well as the effects on the outcome in the short, medium, and long term.

The leadership succession literature generally focuses on three theories (see e.g., Soebbing & Washington, 2011). Each of these theories suggests different effects of leadership succession on organizational performance. The vicious circle theory suggests that succession has a negative effect on performance. The common-sense theory predicts a positive effect on performance. Finally, the ritual scapegoating theory suggests no relationship exists between leadership turnover and performance.

There is mixed evidence in the context of sports. Results from Brazilian football support the ritual scapegoating theory (Galdino et al., 2021). However, analyzing the English football league, Audas et al. (2002) show that

managerial changes lead to improved performance. Audas et al. (2006), on the other hand, demonstrate that coaching negatively impacts the performance of hockey teams, which is consistent with the vicious circle theory. Soebbing and Washington (2011) highlight the role played by time, as their finding initially supports the vicious circle theory but suggests that performance improves if the coach has enough time to introduce appropriate adjustments. Soebbing et al. (2015) also find evidence for the common sense theory but note that an eight-week period is necessary for leadership succession to positively affect performance.

It is also of interest to examine Duff's model (2013) of leadership as a dynamic process. Duff describes leadership as a process that requires leaders to perform different leadership styles: goal-centered (transactional leadership), consultative (transformational leadership) and supportive (servant leadership). In servant leadership, leaders support team members with both work-related and personal development support. Central to servant leadership is nurturing a personalized relationship between leader and employee, where motivation and development opportunities are tailored to provide optimal support for employee performance. Moreover, a crucial characteristic of servant leadership is empowering subordinates (Liden et al., 2008). Based on social role theory, Duff (2013) suggests that women leaders are more likely to embrace a servant leadership style. Importantly, different leadership styles are required at different stages. While, overall, servant leadership is expected to exert the most considerable beneficial leverage on team performance.

Dawley et al. (2004) explore gendered succession by looking at whether the incoming coach is either an 'insider' – a coach who was previously an assistant coach before becoming a head coach – or an 'outsider' who has no existing ties to the team. Their research analyzes the performance after coach changes in the short – and long-term in women's

basketball team. While the study concludes that in the long term there is no difference in performance between male and female coaches, the hiring of a female 'insider' coach improves performance in the short term. Finally, Nessler et al. (2021) show gender bias in the tenure of coaches in women's soccer. They conclude that women have shorter tenures than men, with female coaches dismissed earlier than their peers after controlling for performance.

## Historical background

International female tennis competition between nations started in 1923 when teams from Britain and the US competed on a yearly basis. In 1963, the competition opened for 16 nations. The competition lasted one week and was played at a different venue every year. The competition was organized in knock-out stages. The tournament was played in a "best-of-three" competition between nations. Two matches were singles (one player against one player), and one match was doubles (two players against two players). The first two decades were dominated by the US and Australia (overall, these countries won 18 out of 20 possible championships). The number of participating teams steadily increased (23 teams in 1968; 31 in 1975; 32 since 1976). The tournament further increased and introduced a pre-qualification round in 1983. The competition became greater even as many countries have won the Cup since 1987. As the number of competing nations increased, even further pre – and main-qualifying rounds were added in 1990.

Qualifying was split into geographic regions (Americas, Asia/Oceania, and Europe/Africa). In 1995 the current format came into place. Three groups replaced the previous format. The organization itself describes it as follows: The current format [...] incorporates an eight-nation World Group I and eight-nation World Group II [...]. The remaining nations are

divided into three regional zones depending on their location. Promotion and relegation are played each year, while the countries in World Group I compete to be crowned champion (Women's Tennis Association, 2018a). The time span of the tournament increased over the years. Before 1995 the (final) tournament lasted one week. Since 1995 the different rounds are split up over one year (e.g., in 2017 in February, April, and November). Additionally, the format changed from best of three to best of five (with four single matches and one doubles match).

## Methods

### *Data and variables*

The data in this study came from multiple sources. Single match and court data were from the official homepage. Individual player data were from the following webpage (<https://github.com/JeffSackmann>). Coach data were available through the coaches' homepage, the coaches' federation, or the program OnCourt. We had to exclude about 40% of World Group 3 data because we could not find accurate information regarding the gender of the coach.

We break down our data into three categories: player, coach, and match and court data. For the player, we include information from the WTA ranking. The WTA describes the ranking as follows "[rankings] are based on a 52-week, cumulative system. A player's ranking is determined by her results at a maximum of 16 tournaments for singles and 11 for doubles" (Women's Tennis Association, 2018b). The highest rank is 1, and the lowest ranked position is 2000. Unranked players are assigned the lowest rank. Player ranking is frequently included in the literature to control for the player expertise (see e.g. Koning, 2003; Krumer et al., 2016). In addition, handedness

differentiates between left-handed, right-handed, and unknown. Younger or lower-ranked players are often marked as unknown. It is unclear in the literature if left-handed players have a permanent advantage (for a short discussion c.f., Holtzen, 2000; Loffing et al., 2012). Nonetheless, the impact of left-handed players might impact our results. We also include a player's age as it could be a proxy variable for experience and thus influence the player's performance.

The gender of the coach is our independent variable of interest. Billie Jean King Cup data are appropriate because many coaches are female (38.3% in our sample). As a benchmark for comparison, however, in Canadian interuniversity sport, only 20% of coaches are women (Reade et al., 2009). Overall, studies in different countries reveal that female high-performance coaches account for 8.4% to 20% (see e.g., Bentzen et al., 2016; Fasting et al., 2017). The performance of the coach can depend on age, previous experience as a player, experience as a coach, and experience within a team. Accordingly, we include those explanatory variables in our analysis. Because both, age and experience variables, may exhibit a non-linear relationship with performance, we also include the squares of these variables in the set of covariates.<sup>1</sup>

For match and court data, we stick to previous research in this area (e.g., Dietl & Nesseler, 2017). We include the surface of the pitch, i.e., we differentiate between clay, hard court, and carpet. The majority of the matches are played on clay or hard court; only a minor share (about 2.7%) of the matches are on carpet. Historically, some players perform better on a specific surface; therefore, we include the surface type as an explanatory variable. We also include the different rounds of the tournament<sup>2</sup>: Group Stage, Round 1 and 2, and Final. In addition, as a small number of

<sup>1</sup>One can also include the time between the matches as an additional control variable. We performed a robustness check and included the days between the matches – the results are extremely similar and available upon request.

<sup>2</sup>The rounds are included as individual dummies in the empirical analysis.

tournaments have additional rounds, we code them as round-robin and playoffs.

Furthermore, we differentiate between the different world groups inside the Billie Jean King Cup. The player rankings at the world groups are different, i.e. the average WTA ranking for world group 1 has a mean of 269 (standard deviation-SD = 246), for world group 2, the mean is 494 (SD = 287), and for lower groups, the mean is 607 (SD = 309).

Finally, the dependent variable, match outcome, is a binary variable that distinguishes between either winning or losing a match. Table 1 shows the descriptive statistics.

### Empirical analysis

We analyze the data with two models. Prior to focusing on the primary purpose of the paper, which is to analyze the impact of the change of a coach on singles female match performance in the short-, medium- and long-term, we also look at the very short-term. First, we measure the very short-term effect of coach changes with a regression discontinuity design (RDD). RDD's are optimal for exploring how a variable evolves depending on a (in our case: sharp) cut in time.<sup>3</sup> Sharp means, in our case, that we have a jump from 0 to 1 (cf., Lee & Lemieux, 2010). The cut  $c$  means that a nation  $N$  receives a new coach  $G$ , either female ( $G = 1$ ) or male ( $G = 0$ ). This means we have four models for the very short term:

$$\begin{aligned} \text{Model 1.1: } G &= 0 \text{ if } N \geq c \text{ and } G \\ &= 1 \text{ if } N < c \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Model 1.2: } G &= 1 \text{ if } N \geq c \text{ and } G \\ &= 1 \text{ if } N < c \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Model 1.3: } G &= 1 \text{ if } N \geq c \text{ and } G \\ &= 0 \text{ if } N < c \end{aligned} \quad (3)$$

$$\begin{aligned} \text{Model 1.4: } G &= 0 \text{ if } N \geq c \text{ and } G \\ &= 0 \text{ if } N < c \end{aligned} \quad (4)$$

There are the following potential scenarios: A nation appoints a new coach with the same gender as the predecessor (Model 1.2 for females and Model 1.4 for males), or a nation appoints a new coach with a different gender as the predecessor (Model 1.1 for female to male, and Model 1.3 for male to female). The outcome variable  $Y$  is the match outcome. We can summarize the first model (including 1.1, 1.2, 1.3, and 1.4) as follows:

$$Y = \beta_0 + G_\omega + \beta_1 * N \quad (5)$$

where  $\omega$  denotes the treatment effect at the cutoff.

Second, we examine the data regarding the short-, medium-, and long-term effects with the following Linear Probability Models<sup>4</sup>:

$$\begin{aligned} \text{Model 2.1: } Y_n &= \beta_0 + G \text{ Shortterm}_n \\ &+ G \text{ Mediumterm}_n \\ &+ G \text{ Longterm}_n \end{aligned} \quad (6)$$

$$\begin{aligned} \text{Model 2.2: } Y_n &= \text{Covariates Model 2.1} \\ &+ \gamma * Z_n \end{aligned} \quad (7)$$

$$\begin{aligned} \text{Model 2.3: } Y_n &= \text{Covariates Model 2.2} \\ &+ \varsigma * W_n \end{aligned} \quad (8)$$

$$\begin{aligned} \text{Model 2.4: } Y_n &= \text{Covariates Model 2.3} \\ &+ \eta * Z_n \end{aligned} \quad (9)$$

Although this analysis could also be performed with a logit regression, the Linear Probability Model offers a more straightforward interpretation of coefficients compared to logistic regression models. Moreover, we ran robustness-checks (see e.g., Hyslop, 1999) employing logistic models (logit and probit), and the

<sup>3</sup>RDD is a quasi-experimental design commonly used in economic studies. It is an appropriate method when there is a cutoff or a threshold level (see e.g., Hahn et al., 2001). Some recent sports economics and management papers have also employed this technique, such as Brachert (2021) and Reilly and Witt (2021).

<sup>4</sup>The Linear Probability Model is a linear regression approach for binary outcome variables.



**Table 1.** Descriptive Statistics.

| Variable                                        | Mean     | Std. Dev. | Min.   | Max.   |
|-------------------------------------------------|----------|-----------|--------|--------|
| <u>Player data for female coaches (n = 518)</u> |          |           |        |        |
| WTA ranking                                     | 942.396  | 819.158   | 3      | 2000   |
| Handedness                                      |          |           |        |        |
| Left                                            | 0.067    |           |        |        |
| Right                                           | 0.787    |           |        |        |
| Undecided                                       | 0.146    |           |        |        |
| Age <sup>a</sup>                                | 21.503   | 4.189     | 14.111 | 39.346 |
| <u>Player data for male coaches (n = 571)</u>   |          |           |        |        |
| WTA ranking                                     | 979.942  | 831.909   | 2      | 2000   |
| Handedness                                      |          |           |        |        |
| Left                                            | 0.053    |           |        |        |
| Right                                           | 0.764    |           |        |        |
| Undecided                                       | 0.183    |           |        |        |
| Age                                             | 21.792   | 4.385     | 14.111 | 39.346 |
| <u>Female coach data (n = 299)</u>              |          |           |        |        |
| Age                                             | 37.227   | 8.680     | 19.892 | 57.753 |
| Former WTA ranking                              | 211.968  | 259.018   | 4      | 1121   |
| Experience as a coach, in years                 | 8.987    | 9.211     | 0      | 33     |
| Experience with team, in years                  | 4.69     | 3.543     | 1      | 13     |
| Previous coach winning percentage               | 0.441    | 0.364     | 0      | 1      |
| <u>Male coach data (n = 243)</u>                |          |           |        |        |
| Age <sup>b</sup>                                | 41.025   | 10.070    | 19.750 | 69.452 |
| Former ATP ranking                              | 639.246  | 816.319   | 16     | 5335   |
| Experience as a coach, in years <sup>b</sup>    | 9.247    | 4.8       | 1      | 22     |
| Experience with team, in years                  | 3.484    | 2.572     | 1      | 12     |
| Previous coach winning percentage               | 0.44     | 0.363     | 0      | 1      |
| <u>Match and court data (n = 1093)</u>          |          |           |        |        |
| Match outcome                                   | 0.519    | 0.500     | 0      | 1      |
| World group                                     | 1.746    | 0.739     | 1      | 3      |
| Surface                                         |          |           |        |        |
| Carpet                                          | 0.026    |           |        |        |
| Clay                                            | 0.407    |           |        |        |
| Hard court                                      | 0.567    |           |        |        |
| Round                                           | 4.53     | 2.154     | 1      | 8      |
| Match                                           | 0.5      | 0.5       | 0      | 1      |
| Year                                            | 2010.328 | 2.842     | 2006   | 2016   |

<sup>a</sup>Months are converted into decimals.

<sup>b</sup>We include age and coach experience as squared in the models as well.

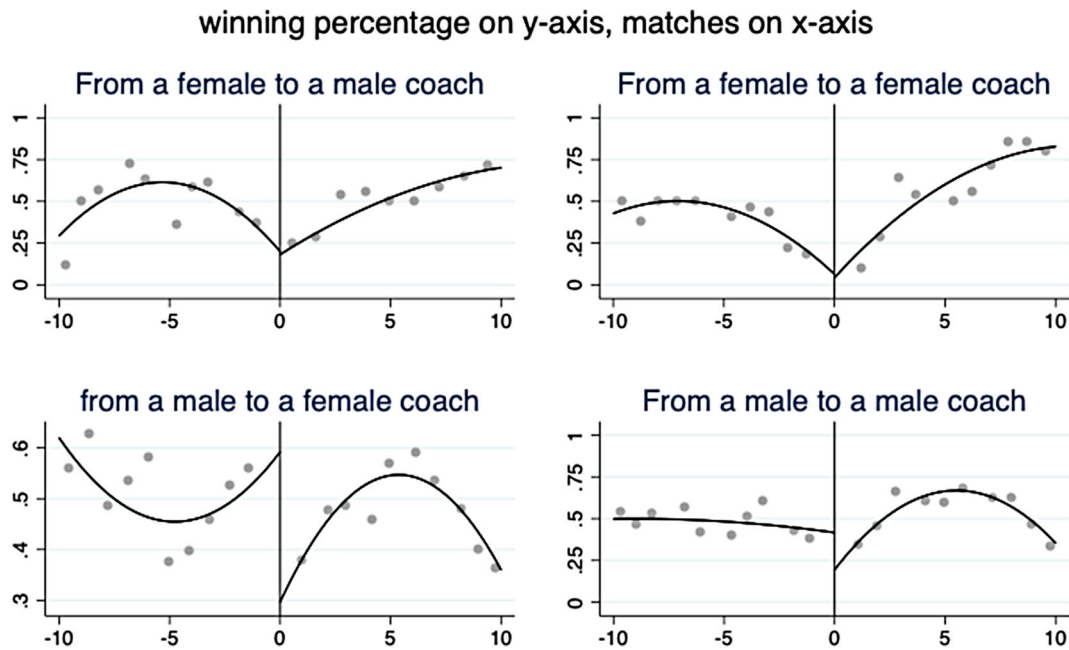
outcomes were alike.<sup>5</sup> For a detailed discussion regarding the benefit of using either model, see Angrist (2001) and Beck and Katz (2011).

$Y$  is the match outcome for nation  $n$ .  $\mathbf{G}$  *Shortterm* $_n$  is the short-term span of the first five matches for a coach after being hired (formally [1, 6]). Several authors emphasize that it is essential to observe different time periods for coaches (cf., Fabianic, 1994; Hughes et al., 2010; White et al., 2007).  $\mathbf{G}$  *Mediumterm* $_n$  spans over the matches 6–10 [6, 10].  $\mathbf{G}$  *Lonterm* $_n$  includes all matches after the first 10 matches [10,  $\infty$ ]. The maximum values are 57 (when

females follow male coaches); 29 (when males follow female coaches); 24 (when males follow male coaches); 24 (when females follow female coaches). All  $\mathbf{G}$  vectors include four binary variables, namely, two variables for a former male coach (and then either a female or a male coach) and two variables for a retired female coach (and then either a female or a male coach). We include player, coach, and match and court data stepwise to show their effects.

The vector  $\mathbf{Z}$  is a set of player characteristics: WTA ranking, handedness, and age. To

<sup>5</sup>The explanatory variables had same significance and direction, showing only minor differences in magnitude. Authors can be contacted regarding the outputs of the logit and probit models.



**Figure 1.** Change of coach winning percentage on y-axis, matches on x-axis.

compare the ranking of the two players, we use the log of the rank of the winner of a match minus the log of the rank of the loser (cf., Koning, 2011; Krumer et al., 2016). The vector  $\mathbf{W}$  is a set of coach characteristics: gender, age, former ranking, experience as a coach and experience with the team. As noted above, we also include the squared terms for age and coach experience. The vector  $\mathbf{Q}$  is a set of match and court characteristics: surface, match, round, world group, and year.

## Results and discussion

### Models 1

Before focusing on our primary findings (the short-, medium-, and long-term) it is interesting to ascertain to examine the very short-term impact. Figure 1 shows the case when a national team had a female or male coach

and switched to a male or female coach, respectively. On the y-axis, we display the winning percentage; on the x-axis, we present the number of matches. The graph includes the last 10 matches of the predecessor and the first 10 matches of the successor. One bin (or point) denotes one match. The point estimator is not significant for any of the graphs.<sup>6</sup> Accordingly, we can rule out that replacing a female with a male coach or vice versa has a very short-term performance effect.

We use three different estimators: conventional, bias-corrected, and robust. The conventional method is a local polynomial estimator; the bias-corrected estimator includes conventional variance and plug-in residuals, and the bias-corrected estimator includes robust variance and plug-in residuals. For information regarding the mathematical set-up, see Calonico et al. (2014). The three estimators are not statistically or significantly different from each other.

<sup>6</sup>The results for Figure 1 are available in a table form upon request.

**Table 2.** Regression Results – Linear Probability Models.

|                                |                                 |                     | Dependent variable: Match outcome (1 for win, 0 for loss) |                   |                     |                     |
|--------------------------------|---------------------------------|---------------------|-----------------------------------------------------------|-------------------|---------------------|---------------------|
| Variables                      |                                 |                     | Model 2.1                                                 | Model 2.2         | Model 2.3           | Model 2.4           |
| Former coach is a female coach | Current coach is a male coach   | Matches 1–5         | –0.138<br>(0.085)                                         | –0.119<br>(0.092) | –0.171<br>(0.213)   | –0.029<br>(0.205)   |
|                                |                                 | Matches 6–10        | 0.083<br>(0.086)                                          | 0.083<br>(0.088)  | 0.037<br>(0.185)    | 0.098<br>(0.202)    |
|                                | Current coach is a female coach | Later matches       | omitted                                                   | omitted           | omitted             | omitted             |
|                                |                                 | Matches 1–5         | –0.116<br>(0.116)                                         | –0.055<br>(0.120) | –0.084<br>(0.214)   | –0.039<br>(0.161)   |
|                                |                                 | Matches 6–10        | 0.203*<br>(0.104)                                         | 0.166<br>(0.124)  | 0.269<br>(0.164)    | 0.453***<br>(0.152) |
|                                |                                 | Later matches       | omitted                                                   | omitted           | omitted             | omitted             |
| Former coach is a male coach   | Matches 1–5                     | Matches 1–5         | –0.070<br>(0.071)                                         | –0.017<br>(0.076) | –0.055<br>(0.107)   | 0.050<br>(0.100)    |
|                                |                                 | Matches 1–5         | –0.070<br>(0.071)                                         | –0.026<br>(0.076) | –0.063<br>(0.107)   | 0.02<br>(0.100)     |
|                                | Current coach is a female coach | Matches 6–10        | –0.031<br>(0.088)                                         | 0.006<br>(0.093)  | –0.084<br>(0.155)   | –0.021<br>(0.145)   |
|                                |                                 | Later matches       | omitted                                                   | omitted           | omitted             | omitted             |
|                                | Current coach is a male coach   | Matches 1–5         | –0.022<br>(0.079)                                         | 0.006<br>(0.083)  | 0.060<br>(0.155)    | 0.130<br>(0.133)    |
|                                |                                 | Matches 6–10        | 0.031<br>(0.076)                                          | 0.024<br>(0.078)  | –0.044<br>(0.099)   | 0.040<br>(0.092)    |
|                                |                                 | Later matches       | omitted                                                   | omitted           | omitted             | omitted             |
|                                |                                 | Player data         |                                                           | Yes               | Yes                 | Yes                 |
|                                | Coach data                      |                     |                                                           | Yes               | Yes                 |                     |
|                                | Match & court data              |                     |                                                           |                   | Yes                 |                     |
| Constant                       |                                 | 0.542***<br>(0.043) | –0.552<br>(0.178)                                         | –.777<br>(0.635)  | –1.469**<br>(0.631) |                     |
| Observations <sup>a</sup>      |                                 | 1,093               | 944                                                       | 383               | 380                 |                     |
| R-squared                      |                                 | 0.020               | 0.035                                                     | 0.088             | 0.204               |                     |
| Adj. R-squared                 |                                 | 0.013               | 0.021                                                     | 0.043             | 0.121               |                     |

Note: Robust standard errors (clustered at national level) in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

<sup>a</sup>The number of observations reduces due to unavailable information on player, coach, match and court data.

## Models 2

Table 2 reports the results of Models 2.1–2.4.<sup>7</sup>

The results show that when the predecessor and successor are both female, females clearly perform better in the medium-term (6–10 matches). However, in all other cases, independent of the gender of the predecessor, neither females nor males outperform each other.

## Discussion

Coaching is one example in sports that continues to belong to the male domain (Norman, 2016). Accordingly, most previous studies analyzed coach changes in which a male coach is replaced by a new male coach.

We analyze all potential gender combinations associated with coach changes. Overall, our results show that the gender of the new coach has no effect on singles match performance. However, evidence suggests long-term improvements in match performance when a female coach succeeds a female coach.

The contributions of our study are twofold. Firstly, our study advances the theory of leadership succession. In general, replacing a coach has no significant effect on performance either immediately or in the short-, medium-, and long-term. In addition, we also analyzed the effect on immediate output. In contrast to other studies in the sports context that corroborate either the common-sense theory (e.g., Soebbing

<sup>7</sup>We cluster at the national level. It is also appropriate to cluster at the match level. The results are very similar. This table is available upon request.

et al., 2015) or the vicious circle theory (e.g., Audas et al., 2006), our results are in line with those obtained by Galdino et al. (2021) supporting the ritual scapegoating theory. Secondly, our results highlight one important exception: there is a significant long-term improvement of performance when a female coach is replaced by another a female coach. These results partially align with the similarity-attraction paradigm, albeit our results do not support the conclusions of Aicher and Sagas (2010). We do not find a (positive) performance effect when female coach replaces male coach. Moreover, replacing a male with a female coach *per se* does not improve performance. Only the perpetuation of female leadership results in performance improvements.

Wells and Aicher (2013) recognize that the similarity-attraction paradigm is a complex issue regarding team performance. They analyze the performance of women's basketball teams and do not find that gender similarity between the coach and the team members, i.e. female coach and female players, leads to improved performance. Therefore, our research raises an exciting avenue for further research in view of the existing mixed literature on the role of gender in succession decisions.

In addition, our findings concerning successful succession processes are also partially in line with the positive effects of servant leadership (Duff, 2013). A servant leadership style focusing on employee development could be more appropriate for the later stages of the performance management process (Russell & Stone, 2002). Furthermore, servant leadership also helps to improve the team's performance in the next stage by fostering the team members' development throughout a specific stage. Because women are more likely to play servant leadership roles, positive effects arise when both the predecessor and successor are women, although more research on this outcome is necessary.

This beneficial effect on performance caused by the persistence of female leadership

suggests the importance of women gaining social capital to the same extent as men in the sport workplace (Nessler et al., 2021). "It's not that men know the game better than women, it's not that women can't coach the way men can, it's a matter of opportunity." (Walker & Sartore-Baldwin, 2013, p. 310).

Although gender equality clearly is a high priority in policies, it is imperative to examine the underlying weaknesses in sport that perpetuate male hegemony (Graham & Blackett, 2021). Thus, the European Commission's Gender Equality Strategy 2020-2025 identifies a portfolio of pivotal measures necessary to overcome gender stereotypes, promote equal participation and opportunities, and ensure gender balance in decision-making. Moreover, the United Nations recognizes that sports is essential to promoting gender equality (United Nations Women, 2016).

Stakeholders must be aware that sports constitute a rare institution and that the next step for managers is to examine how to implement changes to make sports a more gender-inclusive institution. Gaston et al. (2020) note that the inclusion of women must be approached in terms of both "equality" and "performance." It is therefore urgent to enhance opportunities for women and prevent the hitherto dominant male group from maintaining its status quo in the management of sports organizations (Greenhill et al., 2009).

Although the 38.3% of female coaches in our sample is higher than in many other sports, women are still underrepresented in leadership positions in women's professional tennis. As in other sports, most women have been coached throughout their sporting careers, mainly by male coaches. This has resulted in a shortage of female role models as coaches, which led to many women not aspiring to become coaches (Imeson, 2017). Institutions and governing bodies in sport should not be gender-blind, and individuals involved in sports institutions must understand that they should not use gender as a rationale for discrimination

(de Haan & Sotiriadou, 2019). Duff (2013) suggests reconceptualizing leadership as being based on 'androgynous' competencies. That is, all leaders, whether male or female, should exhibit both traditionally masculine and feminine attributes.

## Conclusions

We empirically examine gender effects in coach changes in the very short-, short-, medium-, and long-term. In general, we do not find evidence that gender significantly affects performance. The primary analysis includes the short-, medium, and long-term effects. Prior to this, we also looked at the very short-term effects. This research is novel because it examines the gender of the coach in the succession process. Interestingly, if female leadership is sustained, performance increases.

Our results have important implications for previous literature in this field. Our findings shed light on the discrimination against women in leadership positions in professional sports settings and encourage significant discussions between federations, national teams, coaches, and players to develop policies regarding fair access for women to managerial roles in professional sports. The overall results clarify that the hiring process of a coach should be founded on skills, experience, and previous performances, where gender should not be taken into account. However, as we also found some positive effects of female leadership in the long-term, more research on the role of gender on performance should be conducted.

This study has limitations as our research only looks at a scenario involving female athletes. It would also be interesting to examine the impact of a change in the gender of the coach on male athletes. In-depth analysis of the role coaches play in tennis and their influence on the players' performance would also be of interest. It may also be of interest to add interaction terms to ascertain how the impact of an explanatory variable might differ according to the values

taken by another variable. Additionally, the study has data-related shortcomings. For instance, we do not control for the fact that players may benefit from home advantage. Although we focus on individual matches, a perspective on whether a nation wins or loses (including all matches in a competition) could be interesting. Finally, the current paper does not evaluate the reasons for the coach turnover since our aim was to investigate the performance after the turnover. This is a relevant gap for future research.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## ORCID

Cornel Nessler  <http://orcid.org/0000-0001-7900-4175>

Cristina Muñiz  <http://orcid.org/0000-0001-9935-8149>

Thadeu Gasparetto  <http://orcid.org/0000-0002-4675-302X>

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