ORIGINAL ARTICLE

Differences between male and female referees in adjudicating male soccer matches

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ABSTRACT

Referees play important roles in the soccer matches, i.e., adjudicating the outcome of the soccer match and the players' performance. Female referees were included into male soccer matches and received a lot of attention recently. Although female referees were suggested to be less competent than male referees and also suffered from discrimination, few studies have not directly compared the female and male referees in adjudicating the male soccer matches. In this study, the data from the last five seasons of Maurice Revello Tournament Cup matches were compared to see whether referee gender differences were exited in adjudicating the players' performance in the tournament. The hypothesize is there were no difference between different genders referees in adjudicating matches. Data from 109 matches (52 with female referee and 57 with male referee) from the 2018 to 2024 seasons were selected and divided them into two groups based on different referee genders. All variables (scores, shots, shots on target, passes, fouls, penalties, yellow cards, red cards, offsides, and corners) were analysed using independent samples t-tests and generalized linear models. The results showed there were no significant difference in all variables (scores, p = .94, shots p = .076, passes p = .729, fouls p = .541, offsides p = .249) between matches adjudicated by female and male referees. The findings indicated that female referees were not weaker than male referees in adjudicating the male soccer matches. It can break the gender prejudges bias and discrimination against female referees and encourage more women to join as soccer referee and adjudicate in male soccer matches.
Keywords: Soccer referees, Female, Matches performance.

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INTRODUCTION

Soccer referees were important roles which decisions inevitably have an impact on the outcome of the matches (Weston, M. et al., 2011, Vasilica, I et al., 2022). They need to make quick and accurate decisions during the match, considering various sources of information (Spitz, J. et al., 2021). Study reported that a referee was required to do over 130 observable decisions during a professional soccer match (Helsen, W. et al., 2006). Referees' decision-making capacities were influenced by various external matches' factors, such as crowd noise (Balmer, N. et al., 2007) , match location (Boyko, R. et al., 2007), social forces (Zelyurt, M. K., & Ataçocugu, M. S., 2017) within-matches pressure from players and coaches (Kubayi, A. et al., 2022), as well as the previous decisions in the matches (Plessner, H., & Betsch, T., 2001). The accuracy of the referee's decisions would affect the outcomes of the matches (Fontenla, M., & Izón, G. M., 2018). Prior studies have demonstrated that the accuracy of referee decision was affected by a number of factors, such as position and distance (Mallo, J. et al., 2012), angle of view (Mallo, J. et al., 2012), match period (Samuel, R. D. et al., 2021), experience level (Nurcahya, Y. et al., 2021), matches control (Jin, G. et al., 2022), physical fitness (Krustrup, P. et al., 2009) and bias (Lane, A. M. et al., 2006). These have given rise to a deepening interest in examining the factors that condition the referee's decision during matches. The decisions of referee would have an impact on a player's matches performance. Study showed the standards of foul decision affected the intensity of player opposition and variations in the referee's decision standards would affect the performance of players throughout the period of the match resulting in variations in the intensity of the matches or the adventurous of the matches (Fontenla, M., & Izón, G. M., 2018). Red and yellow card decisions might make players more cautious in their follow-through and less effective in the matches (Badiella, L. et al., 2023). In addition, referee's movement routine and methods during the matches could affect team matches tactics and player movement options (Jiang, J. et al., 2023). Finally, the unfair decisions which players think had a negative impact on their morale, confidence and performance (Lex, H. et al., 2015).

Previously female referees mainly adjudicated female soccer matches. Match analysis study had shown that male soccer matches were played at a faster pace than female soccer matches (Krustrup, P. et al., 2005). Specifically, in tournaments at comparable levels of competition, female professional players moved only two-thirds of the distance of male players at high intensity (i.e., speeds ≥15 km-h-1) (Datson, N. et al., 2014). This demonstrated that male soccer players were actually subjected to greater external loads. Study also showed there were fewer fouls in female soccer matches than in male matches, and male soccer matches were more passing accuracy and more confrontational (Pappalardo, L. et al., 2021). Compared to male referees, female referees physical fitness were weaker than male referee (Castagna, C. et al., 2018). Female matches had less requirements in matches management and foul recognition (Pappalardo, L. et al., 2021). Female referees were exposed to sexist language and abuse when adjudicating matches, sometimes related to traditional gender roles or the incompetence of female referees, and sometimes in the form of extreme and threatening behaviour (Gubby, L., & Martin, S., 2024). There were also some bias against female referees, as studies had shown that female referees were incompetent, weak, unqualified and unskilled (Perreau-Niel, A., & Erard, C., 2015). They were also more vulnerable to violence and discrimination and faced a wider range of gendered barriers than men (Reid, K., & Dallaire, C., 2020).

Although a large number of studies have expressed the view that female referees were inferior to male referees (Pappalardo, L. et al., 2021; Castagna, C. et al., 2018). However, there was also evidence proved that top female referees could achieve the physical demands of medium-standard male referees and maintained the distance from the ball throughout the matches (Mallo, J. et al., 2010). Meanwhile, female referees' weaknesses in aerobic endurance are not associated to the decision making abilities (Castagna, C. et al., 2018). The combination of gender and technology and how they affect refereeing roles has not been

the focus of research (Skirbekk, S., 2024). In recent years, female referees have increasingly appeared in male soccer matches. However, to the best of our knowledge, no study has been conducted to directly compare whether there are difference between male and female soccer referees on the performance of players in male soccer matches.

This study aimed to compare the performance between male and female referees in adjudicating male soccer matches in different seasons of the competition, using the Maurice Revello Tournament Cup as an example. We hypothesize that there were no difference between male and female referees in adjudicating goals, shots, passes, fouls, penalties, yellow cards, red cards, offsides and corners in matches.

METHODS

Match sample

The sample included total of 109 matches played in the Maurice Revello Tournament Cup (52 with female referee and 57 with male referee) from the 2018 to 2024 seasons. Female referees were first entered to the Cup in 2022 season. Therefore, the seasons pre and post the entrance of female referees were compared and analysed. All the data were obtained from the official website of the Maurice Revello Tournament Cup (www.tournoimauricerevello.com) and Google (www.google.com). Match data for the 2024 Maurice Revello Tournament Cup were taken from the post-match reports on its official website. Other seasons match data were taken from the post-match reports on Google (search key words 'Maurice Revello Tournament Cup') page. Match data were provided by the company's observational system (OPTA Client System). The OPTA client system is used to collect real-time football match statistics, with operators manually entering match events and statistics in real-time; the system is predefined to cover every touch and touch action that may occur during a match; comprehensive event tracking (including player-specific actions) is available; and to ensure accuracy, the same match can be independently coded by multiple operators for cross-checking and validation (Liu, H. et al., 2013). The interoperate reliability of the OPTA used to collect soccer match statistics was identified as reliable reaching an acceptable level of Kappa, ICC, r and SEM values. The data set will be double-checked to improve the accuracy of the data. Furthermore, the data is publicly available and free of charge. This Ethics of the research was approved by Hong Kong Baptist University.

Selection of match performance metrics

In accordance with similar studies, the selection of match performance metrics should be included players' self-players, opponent performance and the decision-making of the referee (Bao, R., & Han, B., 2024). Therefore, the indicators included: scores, shots, shots on target, passes, fouls, penalties, yellow cards, red cards, offsides, and corners (Fernández-Cortés, J. et al., 2022). In addition, some other data (e.g. 1st half time, 2nd half time and total time) can be used to explore the impact of different sex of referee. However, since such data was generally not publicly available, it is difficult to obtain. Therefore, this study preferred to analyse the accessible data from the Maurice Revello Tournament Cup website.

Data analysis

All data were presented as means ± SD and imported into SPSS (version 29.0, Illinois, USA) for analysis. The statistical significance was set to $p < .05$. Firstly, an independent sample T-test was used to compare the performance metrics between female referees and male referees. In addition, a generalized linear model (GLM) was initially fitted for each variable with using the Bayesian Information Criterion (BIC) and 95% confidence intervals (CI). Effect sizes (Cohens 'd) were categorized as small (d = 0.20), medium (d = 0.50) and large (d = 0.80).

RESULTS

Table 1 presented the descriptive statistics and the comparison of match performance variables for the Maurice Revello Tournament Cup between female and male referees. There were no significant different in all variables. Female referees adjudicating matches had more shots than male referees' matches (p = .072, Cohens' d = 0.349, 95%CI (−0.031, 0.727) approaching significant level. For other variables, there were not significantly more in score, shots on target, passes, yellow cards, red cards, offsides, and corners than male referee's matches. Meanwhile, male referee matches in fouls and penalties not significantly more than female referees.

Table 1. Changes of indicators between female and male referees.

Variables	Female		Male		t	*p*	Cohen's d	95% CI for Cohen's d	
	Mean	SD	Mean	SD				Lower	Upper
Scores	2.69	1.89	2.67	1.64	0.076	.940	0.015	-0.361	0.390
Shots	22.17	5.66	20.23	5.50	1.818	.072	0.349	-0.031	0.727
Shots on target	8.04	2.58	7.65	3.02	0.780	.473	0.138	-0.239	0.504
Passes	792.02	115.68	784.54	108.60	0.348	.729	0.067	-0.309	0.443
Fouls	27.10	6.47	27.82	5.93	-0.613	.541	-0.118	-0.494	0.259
Penalties	0.25	0.52	0.33	0.55	-0.815	.417	-0.156	-0.532	0.221
Yellow cards	3.98	1.90	3.68	2.35	0.719	.474	0.138	-0.239	0.514
Red cards	0.17	0.43	0.14	0.35	0.437	.663	0.084	-0.292	0.460
Offsides	3.92	2.09	3.46	2.11	1.160	.249	0.222	-0.155	0.599
Corners	8.04	2.58	7.65	3.02	0.720	.403	0.161	-0.216	0.537

Table 2 showed the estimated findings of the Generalized Linear Model for every matched performance variable. The results also showed that there were no significant different in all variables between the different gender of referees. Same as Table 1. shots variable was also near to significant levels (p = .066). Compared with effect size of the t-test in Table 1, all variables were in small effect size and the results of the generalize linear model show that the p-values of all variables were not at significant levels, consistent with independent t test statistics results.

Table 2. Estimation results of the generalized linear model (GLM).

Variables	Estimate	SE	95% CI		*p*
			Lower	Upper	
Scores	0.026	0.336	-0.630	0.681	.939
Shots	1.945	1.060	-0.132	4.022	.066
Shots on target	0.389	0.536	-0.661	1.439	.467
Passes	7.475	21.286	-34.245	49.145	.725
Fouls	-0.728	1.177	-3.034	1.578	.536
Penalties	-0.083	0.101	-0.282	0.115	.411
Yellow cards	0.297	0.409	-0.505	1.098	.468
Red cards	0.033	0.742	-0.113	0.178	.659
Offsides	0.467	0.399	-0.315	1.249	.242
Corners	0.495	0.584	-0.650	1.640	.397

DISCUSSION

This research revealed finding that there were no difference in all variables between female and male referees. The effect size were very low that indicated that different gender referees had a limited impact on

match performance and did not directly affect these match variables. This could prove that the difference between female referees and male referees did not have a significant impact on players' matches performance.

In recent years, there are more and more female referees appearing in male matches, including the World Cup in Qatar, UEFA Champions League, Asian Cup and many male professional leagues in various countries. However, as far as the researcher's survey is informed, there was a lack of research comparing female soccer referees and male referees adjudicating matches on player performance. Therefore, this study provided a valuable analysis of the comparison of female and male referees on the same tournament (Maurice Revello Tournament Cup).

Checking the distance between the referee and the ball during the matches seemed to be crucial as an parameter to objectively assess the physical and technical performance of the referee, representing the referee's ability to follow the matches (Mallo, J. et al., 2009). Based on the findings of this study we found that there was no significant difference between the adjudicated performance and ability of female and male referees. Previous studies have shown that top female soccer referees can achieve the same level of fitness as male referees. At the same time, they could keep their distance from the soccer during the periods of the matches (Mallo, J. et al., 2010). Similarly, another study of top female assistant referees revealed that, in addition to high intensity activity levels, the athletic demanded of top female assistant referees were similar to those of top male assistant referees as well as the ability of the assistant referees to maintain their distance from the offside line during the matches, suggesting that they were able to keep up with the pace of the matches (Mallo J. et al., 2010). So these studies can be assumed that there was no difference in the physical activity and technical ability of male and female referees when they are adjudicating matches and that it would not have any impact on match performance.

A previous study suggested that there was a huge difference in aerobic capacity between male and female referees, with female referees significantly weaker than male referees, mainly in maximal oxygen consumption (VO_{2max}) (Castagna, C. et al., 2018). However, the fitness performance of soccer referees may be related to variables other than VO_{2max} (Castagna, C. et al., 2007). Although female referees were weaker than male referees in terms of aerobic ability, there was no research to suggest that minimum levels of aerobic capacity were of practical significance for experienced referees to cope with the demands of the matches (Castagna, C. et al., 2018). According to FIFA regulations, in order to ensure that female referees were physically fit to adjudicate male football matches, all female referees should pass the male physical fitness-test before entering men's matches. Although it has also been argued that physical fitness test standards do not have high structural assessment validity for referee fitness evaluation (Weston, M. et al., 2009), selected female referees would not be significantly weaker than male referees in terms of physical fitness.

The type of matches also had an impact on the ability of the referee. Male players ran longer total distances had higher speed thresholds, had higher passing accuracy and were more dominant in the second half during the matches (Bradley, P. S. et al., 2014). On the contrary, female athletes were less muscular and their style of play is less aggressive (Althoff, K. et al., 2010). Differences in the pace and intensity of the matches can make it difficult for female referees to adapt and lack of experience in adjudicating male soccer matches. This created some challenges for female referees in terms of matches management.

In addition, a large number of previous studies have revealed society's bias against female referees. A study on referee gender and bias revealed that biases against women were powerful regardless of the referees'

level of expertise and that male referees' stereotype toward female players tends to be negative, particularly in terms of decision-making (Souchon, N. et al., 2013). Some female referees were capable of competently refereeing soccer matches but still be marginalized in referee department (Reid, K., & Dallaire, C., 2019). Female referees were more likely to be subjected to sexism and harassment during matches (Drury, S. et al., 2022). While it was more acceptable for women to "*present*" their soccer identity in traditional ways, they were also condemned for failing to appropriately display normative femininity or criticized for "*behaving like men*" (Forbes, A. et al., 2015). This could lead to persecution of female referees, often in the form of sexist and homophobic abuse (Jones, C., & Edwards, L. L., 2013).

It was often assumed that female lack the knowledge needed to make good decisions, that they failed to embody the assertive character needed to control the matches, and that they did not have the physical ability to "*keep up*" with the matches, especially in the elite men's matches. But these assumptions were largely rooted in unfounded claims of biological determinism and gender differences circulating in the soccer industry (Reid, K., & Dallaire, C., 2019). The lack of real and reliable matches and data analyses make it difficult to break the bias against female referees.

Another finding was that the matches adjudicated by female referees had more shots compared with male referees according to the result. These factors were related to team tactics and style of play, with teams employing more attacking or possession strategies tending to shoot and score more goals than defensive teams (Dwyer, D. B., & Young, C. M., 2024). This may reflect the fact that matches officiated by female referees are more conducive to the development of attacking skills and tactics.

This study directly observed the influence of female and male referees on athletes' performance by comparing differences in matches data. The objective and factual data is one strength of the present study. Nonetheless, there are some limitations in this study. First, the number of match cases were small and too few data variables. Second, the case for the tournament spanned a long period of time, and some of the laws of the matches and the technical and tactical have changed somewhat dramatically, especially some years affected by Covid-19. Last, the team varies from different seasons and other variables such as team strength were not taken into account.

In future study designs, the first is to increase the match sample size, and the variables of data that can be used to. Second, other relevant variables should also be considered, such as league or cup competitions (end of season matches may be more important than early season matches, and knockout matches are more important), the referee's own style of play, and team strength variables. If possible, other physiological indicators such as heart rate, Rate of perceived exertion (RPE), lactate, and so on can be collected from players and referees to assess their performance.

CONCLUSION

This study observed the effect of different genders of referees on players' sport performance in Maurice Revello Tournament Cup. The results of the current study indicated that female and male referees adjudication male matches were have no different effect on players' performance.

This study could serve as a pilot study for future research on gender in soccer referee. At the same time, it can break the gender prejudges bias and discrimination against female referees and encourage more women to join as soccer referee and adjudicate in men's soccer matches.

AUTHOR CONTRIBUTIONS

Yuxin Zuo, Xuan Liu, Fenghua Sun, Yizhou Yang and Yao Tong were involved in study design, data collection and management. Yuxin Zuo, and Xuan Liu wrote this manuscript. Yuxin Zuo and Xuan Liu contributed equally to this work. All authors read and approved this manuscript before publication.

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No potential conflict of interest was reported by the authors.

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