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Effect of tournament format change on team performance of Chinese Football Super League during COVID-19 pandemic

Efecto del cambio de formato del torneo en el rendimiento del equipo de la Superliga de China de Fútbol durante la pandemia de COVID-19 thletes

Jinying Jiang[1], Huanmin Ge[1] & Yixiong Cui[1,2]

1. School of Sports Engineering, Beijing Sport University, Beijing, People's Republic of China.
2. AI Sports Engineering Lab, School of Sports Engineering, Beijing Sport University, Beijing, People's Republic of China.

Abstract

The outbreak of COVID-19 forced Chinese Football Association to adopt a special format for the 2020 Chinese Football Super League (CSL) after 5-month suspension. All 160 matches (decreased from 240) were divided into two stages (round robin; two-legged knockout) and played behind closed doors in two neutral cities (Suzhou and Dalian). The purpose of this study was to investigate the influence of absence of spectators and format change on teams' winning percentage and match performance. Technical-tactical and event data of all 400 matches during 2019 and 2020 seasons played by 18 teams were collected. A total of 26 performance indicators were extracted and standardized from the original data. The independent t-test results showed that there were statistically significant differences in 13 performance indicators between 2019 season home win and 2020 season win: shot, shot not on target, simple pass, pass, pass accurate, key pass, corner, corner accurate, dribble and take on ($p<0.025$, absolute ES: 0.28-0.74) for player performance as well as defensive fouls, defensive third foul and yellow cards for referee decision-making ($p=0.001$, absolute ES: 0.42-0.45). And there were statistically significant differences in 16 performance indicators between 2019 season home not win and 2020 season not win: shot, shot not on target, touch, simple pass, pass, pass accurate, key pass, corner, corner accurate, dribble, defensive duel, penalty shot and clearance for player performance ($p<0.04$, absolute ES: 0.21-0.93) as well as defensive third foul, defensive foul and yellow card for referee decision-making ($p<0.015$, absolute ES: 0.29-0.43). The findings implied that the change of match locations and absence of team supporters led to a decrease in teams' match performance and an increase in referees' decision. Although top-ranked teams seemed to be unaffected and the low-ranked teams showed an increase in winning percentage, the fairness of such tournament format needs to be reconsidered.

Keywords: soccer; match location; behind closed doors; spectators; home advantage.

Resumen

El brote de COVID-19 obligó a la Asociación de Fútbol de China a adoptar un formato especial para la Superliga de Fútbol de China (CSL) de 2020 después de una suspensión de 5 meses. Los 160 partidos (disminuidos de 240) se dividieron en dos etapas (round robin; nocaut a dos piernas) y se jugaron a puerta cerrada en dos ciudades neutrales (Suzhou y Dalian). El propósito de este estudio fue investigar la influencia de la ausencia de espectadores y el cambio de formato en el porcentaje de victorias de los equipos y el rendimiento de los partidos. Se recopilaron datos técnico-tácticos y de eventos de los 400 partidos durante las temporadas 2019 y 2020 jugados por 18 equipos. Se extrajeron y estandarizaron un total de 26 indicadores de desempeño a partir de los datos originales. Los resultados de la prueba t independiente mostraron que había diferencias estadísticamente significativas en 13 indicadores de rendimiento entre la victoria en casa de la temporada 2019 y la victoria en la temporada 2020: disparo, disparo fuera del objetivo, pase simple, pase, pase preciso, pase clave, esquina, esquina precisa, regatear y asumir ($p<0.025$, ES absoluto: 0.28-0.74) por rendimiento del jugador, así como faltas defensivas, tercera falta defensiva y tarjetas amarillas para la toma de decisiones de los árbitros ($p=0.001$, ES absoluto: 0.42-0.45). Y hubo diferencias estadísticamente significativas en 16 indicadores de rendimiento entre la temporada 2019 en casa no ganar-la temporada 2020 no ganar: disparo, disparo no a puerta, toque, pase simple, pase, pase preciso, pase clave, esquina, esquina precisa, regate, defensiva duelo, lanzamiento de penalti y despeje para la actuación del jugador ($p<0.04$, ES absoluto: 0.21-0.93) así como tercera falta defensiva, falta defensiva y tarjeta amarilla para la toma de decisiones del árbitro ($p<0.015$, ES absoluto: -0.29-0.43). Los hallazgos implicaron que el cambio de ubicación de los partidos y la ausencia de seguidores de los equipos llevaron a una disminución en el rendimiento de los partidos de los equipos y a un aumento en la decisión de los árbitros. Aunque los equipos mejor clasificados no parecieron verse afectados y los equipos de clasificación baja mostraron un aumento en el porcentaje de victorias, es necesario reconsiderar la imparcialidad de dicho formato de torneo.

Palabras clave: fútbol; ubicación del partido; a puerta cerrada; público; ventaja de jugar en casa.

Correspondence/correspondencia: Yixiong Cuia
1. School of Sports Engineering, Beijing Sport University, Beijing, People's Republic of China.
2. AI Sports Engineering Lab, School of Sports Engineering, Beijing Sport University, Beijing, People's Republic of China.
Email: cuiyixiong@bsu.edu.cn

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Introduction

COVID-19 pandemic has spread to almost all over the world in 2020. Relevant epidemic responses of national governments had affected all walks of life, and there was no exception (Callaway et al., 2020). Since the February 2020, the propagation of COVID-19 forced almost all the football leagues worldwide to be postponed or even suspended. While after the resumption, the football federations and organizing committees decided that all matches should be played without the presence of audience in order to avoid possible transmission of the virus. Among all professional football leagues, Chinese Football Super League (CSL) was one of the first that were resumed after a five-month delay.

Most of the recent research investigated whether COVID-19 brought substantial change to player's fitness and mental wellness of different leagues. De Souza et al. (2021) found that players' fitness performance declined at the beginning of COVID-19 season. Schumacher et al. (2021) found that with the resume-to-competition, the 2019-2020 season was finished with low risk to professional football players' health. Similar result was also evidenced by Meyer et al. (2021) in the German Bundesliga and DiFiori et al. (2021) in the North American professional sport leagues. Moreover, De Albuquerque Freire et al. (2020) implied that COVID-19 related restrictions affected the sprinting ability of professional football players, while Mon-López et al. (2020) found that confinement period during COVID-19 influenced both training load and recovery process of top-level football players. In general, players who failed to undertake enough training during this period might suffer a drop in physical performance (Ruano & Teixeira, 2020).

Individual performance can be expanded to team level by calculating the average performance of a subset of players (Duch, Waitzman, & Amaral, 2010). In terms of match performance, Vaudreuil et al. (2021) found that NBA players' technical-tactical performance after recovering from COVID-19 was not statistically different from their pre-COVID level during the 2019-20 season. However, research has found that teams' performances related to shot, tackle and pass success of several professional football leagues were affected by the pandemic (Almeida & Leite, 2021; Bryson et al., 2021; De Souza et al., 2021; Erikstad & Johansen, 2020; Sors et al., 2020). Specifically, the COVID-19 pandemic has turned home advantage (HA) into home disadvantage in the top five European leagues, as matches were played behind closed doors with no audience being present.

Home advantage in sports is one of the small details in a match that have the potential to give a decisive advantage for home team in finishing success (Lago-Peñas, Gomez, & Pollard, 2017), and the existence of HA effect in professional football is well-documented within various research (Buraimo, Forrest, & Simmons, 2010; Nevill & Holder, 1999; Scoppa, 2021). Crowd effects, referee bias and rules within competition are the most significant factors which caused home advantage (Bryson et al., 2021; Dohmen & Sauermann, 2016; Kerry & Albert, 1992; Ponzo & Scoppa, 2018). In general, previous studies indicated that audience support may be one of the main factors determining the performance of home team and referee decision (Dawson, Massey, & Downward, 2020; Peeters & Van Ours, 2021; Ponzo et al., 2018). Bryson et al. (2021) showed that the absence of a partisan home crowd has no effect on the final match score line, but it does result in a reduction of one-third of a yellow card for away teams relative to home teams. One of the most widely accepted explanations for referee bias is the social pressure exerted by the crowd, given that the majority of spectators are typically supporters of

the home team (Erikstad et al., 2020). The recent studies clearly showed a reduced performances of home team and decreased referee bias in European football matches when

teams playing behind closed doors (Almeida et al., 2021; Sors et al., 2020; Tilp & Thaller, 2020). In a word, there was an advantage for home teams in performance related variables such as goal and ball possession (Lago-Peñas et al., 2017; T. Liu et al., 2019; Peñas & Acero, 2007; Peñas & Lago Ballesteros, 2011). However, performance related to referee bias like yellow card as well as team performance such as shot and pass decreased for the visited teams after the COVID-19 pandemic (Almeida et al., 2021; Bryson et al., 2021; De Souza et al., 2021; Erikstad et al., 2020; Sors et al., 2020).

The Chinese Football Super League started 2020 season behind closed doors after a five-month hiatus due to the pandemic. To ensure safety, the Chinese Football Association adopted a major change to the competition format, which was held as a tournament format and different with most leagues worldwide. All 16 teams were split into two groups at the first stage, with all matches being hosted in neutral venues located at Suzhou (East China's Jiangsu Province) and Dalian (Northeast China's Liaoning Province); while the second phase of the two-legged knockout format would also see teams being put into two groups based on their match results in the previous stage, i.e. Title Fight Group and Relegation Fight Group. Compared to the normal seasons, the 2020 season has reduced the number of matches from 240 to 160, and no audience was allowed to be present. Although Zhou et al. (2019) previously found that home advantage in CSL only existed in the technical performance but not physical aspects, little is known about the effects of change in match location and absence of audience on teams playing behind closed doors, considering such special competition format. Therefore, the purpose of the present study was to investigate the influence of absence of spectators and the change of CSL match locations on teams' match performance and referees' decision-making. It was expected that the findings of study could help stakeholders refine tournament format and ensure fairness. The hypothesis was that the winning percentage of teams, team performance and referee decision of CSL declined due to the lack of audiences' support and the change in match location.

Methods

Participants

The data related to the match location and result of all 400 matches played by 18 teams during 2019 and 2020 Chinese Football Super League seasons (fourteen teams had competed in both 2019 and 2020 seasons, one team was relegated to the lower-tier league and one was disbanded after 2019 season, and another two were promoted to CSL during 2020 season) were collected from the official websites of the CSL, and the number of spectators in matches (see Supplementary Table 1) of were obtained from a public website that provide match fixture information (www.transfermarkt.com). Meanwhile, the relevant match performance data were retrieved from a publicly-assessed football data website (www.whoscored.com). The original data of the website is provided by the OPTA Sports Company, with the inter-operator reliability (goal-related indicator: ICC (Intra-class correlation) =0.98; defending related indicator: ICC=0.96; organizing related indicator: ICC=0.99) of the data collection being previously validated (Liu et al., 2013).

Devices

A total of 26 performance indicators related to goal-scoring, defending and organizing (see Table 1) were extracted from the data based on the previous related studies, which showed that these indicators were highly related with match outcome (Gong et al., 2019; Goumas, 2014;

McCarrick et al., 2020; Pollard & Pollard, 2005; Robertson, Back, & Bartlett, 2015; Zhou et al., 2020; Zhou et al., 2018). To avoid the imbalance of absolute match statistics resulted from different ball possession time and to focus on technical-tactical efficiency, they were standardized to per 50% of ball possession of the own team (for goal-scoring and organizing related indicators) or the opposition team (for defending related indicators) before the subsequent analysis according to the following formulas (Liu et al., 2015):

$$V_{stand} = \left(\frac{V_{original}}{P_{team}}\right) \times 50\%$$

$$V_{stand} = \left(\frac{V_{original}}{P_{opposition}}\right) \times 50\%$$

Where V is value of the indicator, P_{team} and $P_{opposition}$ are the ball possession of the own team and the opposition team.

Table 1. Match performance indicators and definitions

Group of variables	Performance indicators
Goal-scoring related	Goal: goal achieved Shot: an attempt to score a goal, made with any (legal) part of the body, either on or off target Shot on target: an attempt to score a goal which required intervention to stop it going in, or resulted in a goal/shot which would go in without being diverted Penalty shot player fouled within the penalty box leading to a penalty kick
Organizing related	Touch: a sum of all events where a player touches the ball, so exclude like aerial lost or challenge lost Simple pass: passing other than the long pass, cross, freekick pass, throw in and goal kick Long pass: the distance of pass > 31.85m Pass: an intentional ball played from one player to his teammate Pass accurate (%): successful passes as a proportion of total passes Key pass: the final pass or pass-cum-shot leading to the recipient of the ball having an attempt at goal without scoring Aerial duel: Two players competing for a ball in the air, for it to be an aerial both players must jump and challenge each other in the air and have both feet off the ground Corner: ball goes out of play for a corner kick Corner accurate (%): successful corners as a proportion of total corners Offside: being caught in an offside position resulting in a free kick to the opposing team Dribble: an attempt by a player to beat an opponent in possession of the ball Take on: the player beats the defender while retaining possession Cross: Any pass that delivers the ball into the penalty area by the attacking team, from lateral areas of the attacking third (not played inside of the penalty area).
Defending related	Clearance: An action (generally a pass) when the player, while having other option, to pass or to hold the ball, is instead clearing it, either with a long pass forward without a precise target or for a throw in/corner kick, playing safe Interception: a player intercepts a pass between oppositions and prevents the ball finishing its target Tackle: the action of gaining possession from an opposition player who is in possession of the ball Defensive foul: defensive infringement that is penalized as foul play by a referee Defensive third foul: that is penalized as foul play by a referee in a team's own backfield (from the goal line to the halfway line 35 meters) Yellow card: where a player was shown a yellow card by the referee Red card: where a player was sanctioned a red card by the referee Defensive duel: an 50-50 contest between defensive players and attacking players in the match Defensive aerial: the defensive player challenge in the air against opposition.

Procedure

To investigate the influence of change in supporters and tournament format, the Pearson's Chi-square test was used to analyze the effects between match outcome (win and not win) and different seasons (2019 and 2020) for all CSL teams and three ranking groups, considering their end-of-season rankings during 2019 season (top: the top-4 ranked teams; middle: teams ranked from fifth to twelfth in league; low: the bottom-4 teams). And we only considered the teams who had competed in both 2019 and 2020 seasons. Besides, a Chi-square test was used for low-ranking teams during the first stage and the second phase of 2020 season to help further clarify the difference in match outcomes for low-ranking teams between 2019 and 2020 seasons. Furthermore, the effects between match outcome and presence of limited spectators in the 2020 season were also tested (107 matches played without spectators and 53 played with limited number of spectators), employing the same test to verify whether the limited number of spectators had influenced the match results. Effect sizes (ES) of the tests were calculated using the Cramer's V and their interpretation was based on the following criteria: 0.10, small; 0.30, medium; and 0.50, large (Volker, 2006).

Finally, an independent t-test was used to determine the differences between 2019 and 2020 in 26 match performance indicators, considering two groups of comparison: 2019 home win vs. 2020 win; and 2019 home not win vs. 2020 not win. The Cohen's d and its 95% confidence interval were used to draw inference for the effect size statistics, using the following thresholds: <0.2, trivial; 0.6, small; 1.20, moderate; 2.0, large; and >2.0, very large.(Hopkins et al., 2009) The statistical analyses were done using the SPSS software (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.). The significance value was set at $p<0.05$ for the all analyses.

Results

Figure 1 demonstrates the distribution of winning percentage for teams during 2019 and 2020 seasons. The top-4 teams could win at least half of all matches during both seasons, while the winning percentage of the bottom-4 teams was raised compared with 2019 season.

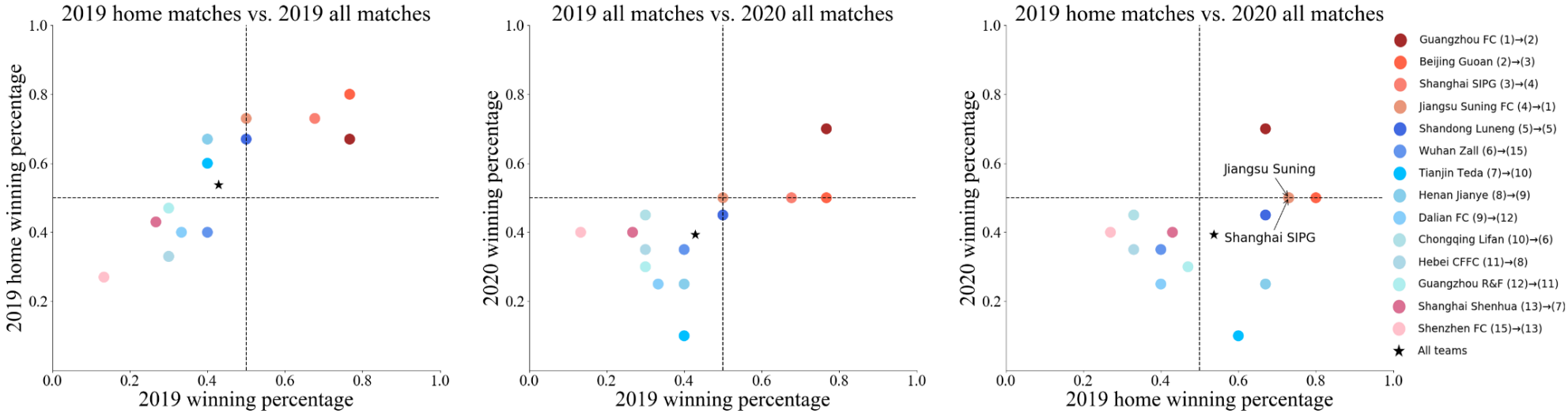

Figure 1. Comparison between 2019 and 2020 matches winning percentage

Notes: a. Teams that competed both 2019 and 2020 season matches were included; b. Tianjin Tianhai (ranked 14th in 2019) was disbanded after that season, so that Shenzhen FC (ranked 15th) remained in the CSL as a replacement for the former team; c. Beijing Renhe (ranked 16th in 2019) was relegated to the lower-tier league and thus was not included; d. (x)⟶(y) in figure legends means denotes the end-of-season ranking in 2019 and 2020 seasons.

The results of Chi-squared tests (see Table 2 and 3) showed no significant differences in match outcomes between 2019 winning percentage and 2020 winning percentage (p=0.35, ES=-0.04), and between 2019 home winning percentage and 2020 winning percentage (p=0.95, ES=-0.003).

When teams played behind closed doors in 2020 season, the winning percentage of teams ranked in top-4 (High-ranking) in 2019 declined from 67.5% to 55% (p=0.07, ES=-0.13), the one for teams ranked between the fifth and the twelfth (Middle-ranking) in 2019 decreased from 36.3% to 31.3% (p=0.30, ES=-0.05). The bottom-4 teams (Low-ranking) won 40% of all matches in 2020, significantly different from their 20% in the previous season (p=0.03, ES=0.22). And there was no significant difference in winning percentage of low-ranking teams between the first and second stage of 2020 season (χ^2=0.36, p=0.55, ES=-0.13).

Table 2. Frequency distribution of match outcomes for all teams and team groups during 2019 and 2020 seasons

	Win		Non win		χ^2	p	df	ES
	N	%	N	%				
Top-ranking (2019)	81	67.5	39	32.5	3.20	0.07	1	-0.13
Top-ranking (2020)	44	55	36	45				
Middle-ranking (2019)	87	36.3	153	63.7	1.07	0.30	1	-0.05
Middle-ranking (2020)	50	31.3	110	68.8				
Low-ranking (2019)	12	20	48	80	4.76	0.03*	1	0.22
Low-ranking (2020)	16	40	24	60				
All teams (2019)	180	42.9	240	57.1	0.88	0.35	1	-0.04
All teams (2020)	110	39.3	170	60.7				

Notes: ***p<0.001; **p<0.01; *p<0.05

Table 3. Frequency distribution of match outcomes for all teams and team groups during 2019 home matches and 2020 season

	Win		Non win		χ^2	p	df	ES
	N	%	N	%				
Top-ranking (2019)	39	65	21	35	1.42	0.23	1	-0.10
Top-ranking (2020)	44	55	36	45				
Middle-ranking (2019)	43	36	77	64	0.65	0.42	1	-0.05
Middle-ranking (2020)	50	31.3	110	68.8				
Low-ranking (2019)	7	22	23	78	2.16	0.14	1	0.18
Low-ranking (2020)	16	40	24	60				
All teams (2019)	89	40	136	60	0.01	0.95	1	-0.003
All teams (2020)	110	39.3	170	60.7				

As for the effect of audience, the result showed that there was no statistically significant difference on game outcomes between matches played with and without spectators in the 2020 season (χ^2=0.38, p=0.54, ES=0.05), and the 53 matches with spectators (average audience number=1609, standard deviation=1834) were treated equally as games without spectators in 2020.

Table 4 shows the means of the technical-tactical performance indicators for teams at both CSL seasons without and with spectators respectively. There were totally 16 indicators statistically different between 2019 home win vs. 2020 win such as dribbles (p<0.001, ES=0.74), pass accurate (p=0.014, ES=0.32) and pass (p=0.007, ES=0.35) all increased, but the number of shots (p=0.019, ES=0.31), take on (p=0.022, ES=-0.30) and corners (p=0.015, ES=-0.32) were decreased. For referee decision indicators, the defensive fouls (p=0.001, ES=0.42) and yellow cards (p=0.001, ES=0.45) were statistically different between 2019 home win and 2020 win matches, as well as between 2019 home not win and 2020 not win matches (defensive fouls: p=0.015, ES=0.29; yellow cards: p<0.001, ES=0.43).

Table 4. Descriptive statistics of match performance variables and results of comparisons between 2019 and 2020 seasons.

	2019 home win	2020 win	t	Sig.	ES	95% CI		2019 home not win	2020 not win	t	Sig.	ES	95% CI	
	M (SD)	M (SD)				Lower	Upper	M (SD)	M (SD)				Lower	Upper
Goal	2.56 (1.25)	2.43 (1.14)	0.81	0.419	0.11	-0.14	0.36	1.00 (0.89)	0.90 (0.96)	0.10	0.321	-0.11	-0.34	0.12
Shot	13.19 (3.98)	11.91 (4.42)	2.36	0.019*	0.31	0.05	0.57	12.83 (4.63)	10.57 (4.96)	4.07	<0.001***	-0.47	-0.70	-0.24
Shot on target	6.02 (2.56)	5.32 (2.23)	2.26	0.025*	0.29	0.03	0.55	4.15 (2.45)	3.38 (2.22)	2.88	0.004**	-0.33	-0.56	-0.10
Touch	583.35 (67.16)	595.63 (72.85)	-1.35	0.178	0.18	-0.08	0.44	562.12 (71.36)	584.82 (85.18)	-2.57	0.011*	0.29	0.06	0.52
Simple pass	329.88 (56.32)	351.75 (71.09)	-2.62	0.009**	0.35	0.09	0.61	318.84 (53.67)	338.25 (70.77)	-2.60	0.010*	0.30	0.07	0.53
Long pass	60.89 (18.61)	57.06 (16.67)	1.67	0.100	0.22	-0.04	0.48	59.60 (15.36)	60.18 (17.11)	-0.26	0.800	-0.04	-0.27	0.19
Pass	396.09 (52.79)	417.16 (65.97)	-2.71	0.007**	0.35	0.09	0.61	384.28 (52.10)	402.18 (60.90)	-2.70	0.007**	0.32	0.09	0.55
Pass accurate	313.88 (59.37)	336.08 (77.60)	-2.47	0.014*	0.32	0.06	0.58	301.81 (54.33)	317.65 (65.20)	-2.25	0.025*	0.26	0.03	0.49
Key pass	10.44 (3.35)	9.24 (3.75)	2.60	0.010*	-0.34	-0.60	-0.08	9.81 (3.81)	8.22 (4.21)	3.40	0.001**	-0.40	-0.63	-0.17
Aerial duel	30.08 (13.26)	28.43 (12.13)	1.00	0.320	0.13	-0.12	0.38	31.63 (10.81)	29.27 (10.72)	1.91	0.060	0.22	-0.01	0.45
Corner	4.32 (2.59)	3.56 (2.18)	2.45	0.015*	-0.32	-0.58	-0.06	4.56 (2.57)	3.93 (2.71)	2.06	0.040*	-0.24	-0.47	-0.01
Corner accurate	2.36 (1.61)	1.92 (1.52)	2.14	0.033*	-0.28	-0.54	-0.02	2.26 (1.71)	1.75 (1.44)	2.86	0.005**	-0.32	-0.55	-0.09
Offside	1.79 (1.59)	1.73 (1.57)	0.28	0.780	-0.04	-0.29	0.21	1.57 (1.45)	1.60 (1.30)	-0.16	0.872	0.02	-0.21	0.25
Dribble	173.27 (31.24)	198.51 (36.48)	-5.72	<0.001***	0.74	0.48	1.00	163.99 (29.36)	199.92 (46.16)	-8.54	<0.001***	0.93	0.69	1.17
Take on	15.76 (6.11)	13.94 (6.03)	2.31	0.022*	-0.30	-0.56	-0.04	15.60 (9.02)	13.97 (6.75)	1.72	0.086	-0.20	-0.43	0.03
Interception	9.19 (4.38)	9.80 (4.70)	-1.03	0.310	-0.13	-0.38	0.12	8.75 (3.82)	8.90 (4.14)	-0.31	0.760	-0.04	-0.27	0.19
Defensive duel	7.39 (4.17)	6.88 (4.08)	0.96	0.340	0.12	-0.13	0.37	7.97 (4.10)	6.84 (3.75)	2.53	0.010*	0.29	0.06	0.52
Defensive aerial	16.63 (8.86)	16.51 (7.80)	0.11	0.910	0.01	-0.24	0.26	16.22 (8.00)	15.60 (7.88)	0.68	0.500	0.08	-0.15	0.31
Cross	11.74 (5.66)	11.02 (5.28)	1.00	0.318	-0.13	-0.38	0.12	14.00 (5.47)	13.50 (6.58)	0.72	0.471	-0.08	-0.31	0.15
Penalty shot	0.29 (0.53)	0.47 (1.04)	-1.60	0.112	0.21	-0.05	0.47	0.15 (0.37)	0.34 (1.22)	-2.07	0.039*	0.21	-0.02	0.44
Defensive third foul	6.32 (3.43)	7.85 (3.53)	-3.37	0.001**	-0.44	-0.70	-0.18	6.54 (3.12)	7.61 (3.53)	-2.76	0.006**	-0.32	-0.55	-0.09
Tackle	15.05 (6.42)	14.74 (6.24)	0.37	0.711	-0.05	-0.30	0.20	15.12(6.35)	14.86 (5.39)	0.38	0.706	-0.04	-0.27	0.19
Clearance	21.78 (7.32)	20.85 (8.03)	0.93	0.352	-0.12	-0.37	0.13	16.71 (6.59)	18.45 (7.72)	-2.07	0.039*	0.24	0.01	0.47
Defensive foul	14.12 (4.95)	16.25 (5.18)	-3.24	0.001**	0.42	0.16	0.68	14.36 (4.55)	15.87 (5.82)	-2.45	0.015*	0.29	0.06	0.52
Yellow card	1.65 (1.36)	2.30 (1.55)	-3.45	0.001**	0.45	0.19	0.71	1.63 (1.25)	2.22 (1.48)	-3.68	<0.001***	0.43	0.20	0.66
Red card	0.02 (0.12)	0.06 (0.26)	-1.70	0.092	0.22	-0.04	0.48	0.06 (0.26)	0.10 (0.31)	-1.18	0.241	0.13	-0.10	0.36

Discussion

In the present study, we examined 160 CSL matches played behind closed doors due to COVID-19 by investigating the effects of change of tournament format on teams' winning percentage and match performance. The current results showed that no substantial difference in the winning percentage between 2019 and 2020 season, except for the low-ranking teams. The presence of limited audience in the last 53 matches of the 2020 season had little influence on the game results. The decrease in goal-scoring related performances and the increase in organizing related performances like pass confirmed the hypothesis that match performance of teams and referees' decision were affected by the change of the format and match location during 2020 CSL. Furthermore, the increased number of defending related indicators maybe revealed that teams and players played more defense during 2020 season.

It worth mentioning that 53 matches played with limited spectators in the 2020 season were treated equally as games without spectators, as the outcome frequency distribution of these matches was not different from those without. One possible explanation is that most of the audience might be local and neutral spectators, and had little effect on players' performance (Wunderlich et al., 2021). Another reason could be that the size of audience was too small to be influential on the match outcome (Ponzo et al., 2018). Furthermore, the decreased winning percentages for top and middle-ranking teams, and increased winning percentages for low-ranking teams in 2020 season revealed that teams' performances were most likely influenced by the lack of familiar home environment and support of home fans (Hill & Van Yperen, 2021). The result of Chi-square for low-ranking teams during the first and second stage of 2020 also confirmed such phenomenon. And it was possible that the new format with the knock-out stage led to this growth in winning percentage. As the performance of inferior teams was largely conditioned by the quality of opponent (Yu, Garcia de Alcaraz, et al., 2020). the change in format to some extent, achieved a competitive balance for the lower-ranked teams.

The COVID-19 pandemic provided a special opportunity to explore some of the key indicators which were thought to make a significant contribution to team performance in football. The present research revealed that due to the absence of the audience, the CSL teams' performance changed in terms of shot, shot on target, simple pass, pass, pass accurate, key pass, corner, corner accurate, dribble, take on, key pass, defensive duel and penalty shot. As for the technical-tactical performance, the current research revealed that within the knockout format, most of teams established their tactics based on defense, which was evidenced by a decrease of goal-scoring related indicators and an increase of defending related indicators. Unsimilar to Sors et al. (2020), we found that the number of corner kicks were decreased in the 2020 season in CSL. Such findings may suggest that the pressure of players not only came from the opponent (Andrienko et al., 2017), but also the spectators. The "ghost games" made players play more relaxed without spectators' boos and yelling. In line with Scoppa (2021), the study also found that with the support of the crowd, a considerable home advantage emerges in various measures of performance (goals, shots, etc.). However, such advantage was almost halved when matches were played behind closed doors (Sors et al., 2020). Compared to the 2019 season, the attacking and organizing performance indicators such as dribbles, touches, passes and pass accurate during 2020 increased; while in contrast, shots, shots on target and key passes decreased, which might indicate that the CSL teams appeared to rely more on the build-up play to win the game. As for the special competition, the numbers of defensive fouls and yellow cards increased implying that the knockout phase (two games were played to decide the winner) could lead the players to be more aggressive.

Meanwhile, as for the referee decision, referee bias is particularly relevant in sports (Erikstad et al., 2020), where partial decision-making can determine competition outcomes, which can have strong repercussions on athletes' performance (Dohmen et al., 2016; Endrich & Gesche, 2020). Previous research found that when competing without audience, away teams would have fewer yellow cards and red cards, so that the effect of HA is balanced to some degree (Bryson et al., 2021). However, the current research showed that compared with 2019 season, the number of indicators related referees' decision-making of 2020 are all increased, which may imply that the decision-making of referees was more resolute without spectators.

In 2020, the reduce of HA in soccer games without audience during the COVID-19 pandemic was confirmed by several research findings (Almeida et al., 2021; Sors et al., 2020; Tilp et al., 2020). Home performance, assessed as home wins as well as point differences between home and away team, decreased after analyzing the collapsed data from 13 European leagues (McCarrick et al., 2020). However, the current study implied that in the CSL, similar change of match performance and winning percentage was mainly attributed to the special format. Similar to Ponzo et al. (2018), the current finding suggested that the spectators' influence constitutes an important factor for teams' performance.

It seemed that limiting the number of audiences and changing the format was a decent choice for the CSL teams during this particular period. However, there are much uncertainty and occasionality in tournament format, due to the nature of the second stage (a knockout format), where there existed vehemently competitive matches. Moreover, the points from the first stage were not accumulated to the second, so that each match of the second stage became more decisive for teams' end-of season rankings. For example, Guangzhou Evergrande lost the final match to Jiangsu Suning, despite having the best match grade throughout the whole season. At the meantime, Tianjin Teda won only one of the total twenty matches, but ranked tenth in the final season. Such fact implied that the change in the league format during this special period might not guarantee the competitive balance in league outcomes for all teams. Currently, the COVID-19 pandemic has been gradually brought under control in China, and it is suggested that normal home/away match format be restored in the CSL, allowing also a restricted number of supporters to be present. The current findings may provide some references for coaches in competitions such as teams should established their tactics based on attack during the knockout format. Meanwhile, tournament organizers were suggested to adjust the CSL league format during the normalized prevention and control of COVID-19 epidemic to achieve fairness.

Whilst the current study provided preliminary evidence regarding the influence of format change on CSL match performance, some limitations should be noted. The first is that the absence of most foreign players, who play a crucial role in teams match strategy and tactics (Yu, Gai, et al., 2020) was not considered. Another limitation is that it is very hard to analyse the effects of the knockout format as well as the empty and neutral stadium separately in CSL. The previous study revealed that the match environment influenced the team performance (Sors et al., 2020), however, the current research revealed that not only the match environment but also the match format would affect the teams' performance. As a matter of fact, the 2021 CSL season is still hosted in two neutral cities (Guangzhou and Suzhou), but the CFA changed the format of the second phase (2021/12/13 to 2022/01/04) to a round robin for Title Fight Group and Relegation Fight Group. Such change of tournament format also may reveal that the league organizer has noticed the issue of fairness during the previous season and has made the effort to refine the tournament. Future research could continue to explore the effect of such change of format on match performance.

Conclusion

This study showed that playing behind closed doors in neutral match location exerted little effect on the match outcomes for the CSL teams during the 2020 season, except for the low-ranking teams. Such phenomenon may be attributed to the lack of familiar home environment and support of home fans had affected the match performance of higher ranked teams, so that winning percentage of inferior teams was increased. However, under the special tournament format, teams performed tended to focus on ball possession and defense, which was evidenced by a reduced goal-scoring related performance such as shot and shot on target, as well as improved organizing and defending indicators like pass and defensive third foul. It was implied that the lack of social support and familiar competition environment influenced teams' match performance. Finally, given that such change in format failed to guarantee the fairness for teams that had better outcome results but finished with comparatively lower standings, the normal double round-robin system should be restored by the CSL stakeholders considering COVID-19 was under control in China.

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