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Original Article

How Brazilian football teams coped with remotely/online strength and conditioning training

Short title: Brazilian football and online strength and conditioning training

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ABSTRACT

The aim of the present study was to investigate the communication/training strategies and technological tools used by fitness coaches from Brazilian football teams during home-based training according to age categories (professional and youth), competitive level (1st, 2nd and 3rd/4th divisions) and sex (male and female). An online questionnaire was applied to collect data. Eighty-two fitness coaches from sixty-seven male and female football teams (professional and youth teams) answered the questionnaire. Message apps were the main communication route between fitness coaches and players during home-based training. Online spreadsheets were frequently used to control the training. Regarding equipment provided to players for training, 70.7% of male professional players used some equipment. In contrast, most female professional and youth players (both sexes) did not receive any equipment, respectively ($p<0.01$). Male players who compete in the 1st and 2nd divisions received more equipment for training than those who compete in the 3rd and 4th divisions ($p<0.01$). The main physical fitness variables trained by all players during home-based training were muscle strength, strength-endurance, and aerobic capacity. Training load and training response were applied through series/repetitions/time and effort perception scales, respectively. In conclusion, the financial differences between professional and youth teams and between males and females and competitive levels can induce different home-based training conditions in Brazilian football teams during lockdown-like situations, especially related to equipment available for training targeted physical qualities. Thus, players should be monitored closely during lockdown-like situations and provided appropriate support to facilitate their training.

Keywords: Lockdown, Soccer, Team sports, Pandemic, Strength and Conditioning.

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INTRODUCTION

In early 2020, a novel coronavirus disease (COVID-19) began to spread around the world rapidly. The World Health Organization (WHO) classified COVID-19 as a global pandemic (World Health Organization [WHO], 2020) on March 11, 2020. In Brazil, the first known COVID-19 infection was diagnosed in February 2020 (Secretaria de Vigilância em Saúde – Brazil, 2020), leading to implementation of public health measures, including social distancing (SD), which required citizens to avoid social meetings, crowded places, habitual greetings (e.g., handshakes), and contact with older individuals (Wilder-Smith & Freedman, 2020; WHO, 2020; Secretaria de Vigilância em Saúde – Brazil, 2020).

The COVID-19 pandemic has also affected football leagues and other sports entities across the world, leading to lock-down in the majority of countries in an attempt to avoid the uncontrolled spread of the disease among players and fans (Corsini et al., 2020; Mohr et al., 2020). In Brazil, regional leagues and national championships were interrupted from March 2020 until June 2020, and the start of the National League changed from May 2020 to August 2020 (Confederação Brasileira de Futebol [CBF], 2020). Consequently, all competition and training activities were suspended in March 2020, and players were instructed to self-isolate. In non-pandemic conditions, football players regularly cease their daily training and competitive activities for a short period of one month after the end of the in-season (i.e., off-season). This off-season period (i.e., regular vacation) is characterised by leisure time with a total absence of scheduled activities (games and training sessions), allowing players to recover from the previous season. On the other hand, during the pandemic situation, when the activities of players were stopped for approximately three months, the stress and concerns related to the uncontrolled COVID-19 pandemic in the country increased (Jukic et al., 2020), which could result in more severe psychological and physical consequences than a traditional off-season period in athletes (Grazioli et al., 2020).

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It should be noted that Brazil has a continental dimension, and the COVID-19 pandemic started when the regional state leagues were in the middle of their competition. In these regional leagues, football teams from different levels (1st, 2nd, 3rd and 4th series and no series) compete against each other. In addition to differences in the levels of teams, the financial reality among football teams in Brazil is very varied, which leads to concerns about when training will return. Furthermore, the velocity at which COVID-19 spread differed among Brazilian states (Cavalcante et al., 2020), and the implemented SD models were distinct according to each state. The challenges in returning to the football pitch may be more evident for the poorer football teams since the safe return involves adherence to recommendations and testing all players for COVID-19 (Primorac et al., 2020), resulting in high financial costs.

In this scenario, each football team probably adopted its own training strategy in an attempt to maintain the physical conditioning of its professional and youth players during the SD period. Home-based physical training challenged fitness coaches since football is a multifaceted competitive team sport involving aerobic endurance, high intensity, and explosive muscle actions, as well as several soccer-specific technical actions (e.g., header, shots, and tackles) (Bangsbo et al., 2006; Mohr et al., 2020). Therefore, it is unlikely that a similar workload can be ensured and monitored between home-based training and traditional on field training (Jukic et al., 2020). During a detraining period, it is accepted to be an overall loss of up to 10% of fitness for each week of inactivity (Varandas et al., 2017). Aimed to avoid a significant reduction in footballers' fitness, Eirale et al. (2020) described recommendations for home-based training for football players, in which the training programme must include aerobic training and strength conditioning activities. In general, for aerobic training, the sessions should not exceed 60 min, the intensity of the effort should be limited to 80% of the maximum heart rate, and the players can perform continuous or

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intermittent running. For strength activities, the sessions also should not exceed 60 min; it is recommended to avoid maximum loads and exercises conducted at complete muscle exhaustion.

Considering the SD provoked by the COVID-19 pandemic, fitness coaches were quickly forced to implement remote training for players confined at home through online technologies (Hammami et al., 2020; Mohr et al., 2020). Football team technical staff members had not previously considered this new training modality (i.e., remote activities). Therefore, we would like to investigate the strategies used by fitness coaches of Brazilian soccer teams during a long period of SD. This investigation is the first with Brazilian soccer teams, and the results can be helpful in the future for fitness coaches to plan the training for injured players during the off-season period.

The aim of the present study was to investigate the communication/training strategies and technological tools used by fitness coaches from Brazilian football teams during the period of SD provoked by COVID-19 according to age categories (professional and youth), competitive level (1^{st}, 2^{nd} and $3^{rd}/4^{th}$ divisions) and sex (male and female). We hypothesised that conditions for home-based physical training would be better for 1^{st} and 2^{nd} divisions, male and professional teams, in comparison to $3^{rd}/4^{th}$ divisions, female and youth teams, respectively.

MATERIALS AND METHODS

Participants

We used a descriptive study design to document the strategies for training football players implemented by Brazilian fitness coaches during the SD for COVID-19. The participants were recruited through phone messages, apps, and social media. The data collection was performed through an online form (Google Forms®). Participants completed

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the form between May and early June 2020. The sample consisted of 82 fitness coaches from 67 football teams that answered the online questionnaire. Therefore, 35 men's teams (1st division = 11; 2nd division = 14; 3rd division and 4th division = 10), 8 women's professional teams (all first division), and 24 youth teams (U-15, U17, and U-20; men's teams = 17 and women's teams = 7) participated in the study. Before completing the questionnaire, all participants were informed about the research procedures and declared their acceptance of participation in this study. We follow the requirements for ethics approvals, indicating that in the sports science area, there might be exceptional circumstances in which strength and conditioning coaches routinely monitor the athletes as part of their employment (Winter & Maughan, 2009). Therefore, the data analysed here are not obtained as part of a formal research project and have not been submitted to an ethics committee.

Measures

The questionnaire comprised four areas: 1) the club (men's or women's team, professional or grassroots categories, SD time, and number of players attached to the training program); 2) the use of technologies (communication with players, communication frequency, training monitoring, and equipment provided for the players); 3) training characteristics (individual or collective training, physical evaluation, physical and physiological capacities, internal and external loads, and injury occurrence); 4) opinion on the new scenario (i.e., remote training) of fitness coaches (Appendix I). The questionnaire was approved by researchers in the sports science area, specifically those with expertise in football science.

In the training characteristics, we asked about training mode (number of players involved in the training – individual, collective or both), physical evaluation (which evaluation was performed during the home-based training), physical fitness (physical and physiological qualities trained during home-based training), training load (external load used

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by fitness coaches), training response (internal load controlled by fitness coaches), training with ball (if this type of training was used during home-based training), and perception scales (which scales were used by fitness coaches).

Statistical Analyses

All statistical analyses were performed using SPSS (v 20.0; SPSS Inc). Data are presented as absolute and relative frequencies for each categorical variable according to age category (professional and youth teams), sex (male and female players), and competitive level for males (1^{st}, 2^{nd}, 3^{rd} and 4^{th} division). The Chi-Square test was used to verify the associations between categorical variables and age categories, competitive level (only for male professional teams) and sex. Cramer's V test was used to calculate the effect size for categorical variables. Comparisons between divisions were not performed for female players since only one female division was collected. The significance level was set at 5%.

RESULTS

Regarding the length of the SD period, 87.7% and 94.1% of male and female football players (professional and youth teams) remained confined for more than 45 days, respectively. In addition, 86.6% of fitness coaches were responsible for monitoring more than 22 football players.

Table 1 shows the technologies and instruments used by fitness coaches and players during the period of home-based training according to age categories (professional and youth teams) and sex (men and women). Message apps were the most commonly used technology to communicate with players, followed by online video chats, social media, and phone calls. Social media was often used by the fitness coaches of women's teams (X^2= 15.538, p= 0.001). Most fitness coaches contacted their players in all categories and both sexes daily. Fitness

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coaches frequently use online spreadsheets to control the training. In addition, women's teams more frequently used specific software for training control (X^2= 7.960, p= 0.047), while men's teams more frequently used offline spreadsheets (X^2= 9.246, p= 0.026). Regarding the provision of equipment to the players, 70.7% of professional male players used some equipment during home-based training. However, only 8.3% of young male players received some training equipment. For professional female players, 40.0% received some equipment, and no youth female players received any equipment for home-based training.

Table 1. Communication and training technologies/instruments used by fitness coaches and players during SD by COVID-19.

	Male players		**Female players**			
	Professional % (n)	**Youth** % (n)	**Professional** % (n)	**Youth** % (n)	**p-value**	**ES**
Communication[A]						
Message app	100.0 (41)	100.0 (24)	100.0 (10)	100.0 (7)	---	---
Online meet	70.7 (29)	66.7 (16)	80.0 (8)	85.7 (6)	0.720	0.13
Phone call	43.9 (18)	16.7 (4)	40.0 (4)	42.9 (3)	0.155	0.25
Social media	22.0 (9)	41.7 (10)	70.0 (7)	85.7 (6)	0.001[§]	0.44
SMS	2.4 (1)	0.0 (0)	10.0 (1)	0.0 (0)	0.365	0.19
Contact frequency						
Daily	68.3 (28)	50.0 (12)	70.0 (7)	57.1 (4)		
3 times/week	19.5 (8)	12.5 (3)	20.0 (2)	28.6 (2)		
Weekly	12.2 (5)	29.2 (7)	10.0 (1)	14.3 (1)	0.382	0.20
Biweekly	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)		
Monthly	0.0 (0)	8.3 (2)	0.0 (0)	0.0 (0)		
Training control[A]						
Online spreadsheet	85.4 (35)	66.7 (16)	90.0 (9)	71.4 (5)	0.240	0.23
Online meet	46.3 (19)	54.4 (13)	50.0 (5)	57.1 (4)	0.912	0.08
Specific software	7.3 (3)	8.3 (2)	20.0 (2)	42.9 (3)	0.047[§]	0.31
Offline spreadsheet	2.4 (1)	20.8 (5)	0.0 (0)	0.0 (0)	0.026[§]	0.34
Equipment provided						
Yes	70.7 (29)	8.3 (2)	40.0 (4)	0.0 (0)	<0.01[§]	0.61
No	29.3 (12)	91.7 (22)	60.0 (6)	100.0 (7)		

[A]For "communication" and "training control" items, percentages within age categories (professional or youth) for male and female professional teams represent a "yes" answer relative to a "no" answer. [§]p<0.05. ES = effect size (Cramer's V test).

With regard to elite male professional football teams competing at different levels (1st, 2nd, 3rd, and 4thdivisions), message apps, followed by online meetings, phone calls, and social media, were the most commonly used technological resources to communicate with players. Furthermore, phone calls presented a higher proportion in teams from the Brazilian 2nd

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division than 1st, 3rd, and 4th division teams (X^2= 6.782, p= 0.034). In all divisions, fitness coaches preferred to contact their players daily and use online spreadsheets to monitor training sessions. Failure to provide equipment for home-based training (X^2= 15.403, p<0.01) was higher for teams in the 3rd and 4th divisions, while the provision of equipment for strength activities (X^2= 15.401, p<0.01) was higher for teams from the 1st and 2nd divisions (Table 2).

Table 2. Communication and training technologies/instruments used by fitness coaches and male professional players during the SD provoked by COVID-19.

	Male Divisions				
	1st division n= 11 % (n)	**2nd division n= 14** % (n)	**3rd/4th divisions n= 10** % (n)	**p-value**	**ES**
Communication[A]					
Message app	100.0 (11)	100.0 (14)	100.0 (10)	---	---
Online meet	72.7 (8)	78.6 (11)	70.0 (7)	0.885	0.08
Phone call	36.4 (4)	71.4 (10)	20.0 (2)	0.034§	0.44
Social media	9.1 (1)	35.7 (5)	20.0 (2)	0.281	0.27
SMS	0.0 (0)	7.1 (1)	0.0 (0)	0.462	0.21
Contact frequency					
Daily	72.7 (8)	64.3 (9)	60.0 (6)		
3 times/week	9.1 (1)	35.7 (5)	10.0 (1)		
Weekly	18.2 (2)	0.0 (0)	30.0 (3)	0.143	0.31
Biweekly	0.0 (0)	0.0 (0)	0.0 (0)		
Monthly	0.0 (0)	0.0 (0)	0.0 (0)		
Training control[A]					
Online spreadsheet	90.9 (10)	78.6 (11)	80.0 (8)	0.691	0.15
Online meet	36.4 (4)	64.3 (9)	40.0 (4)	0.311	0.26
Specific software	9.1 (1)	7.1 (1)	10.0 (1)	0.967	0.04
Offline spreadsheet	0.0 (0)	7.1 (1)	0.0 (0)	0.462	0.21
Equipment provided[A]					
None	9.1 (1)	14.3 (2)	80.0 (8)	<0.01§	0.66
Aerobic equipment*	27.3 (3)	7.1 (1)	0.0 (0)	0.118	0.35
Strength equipment**	90.9 (10)	85.7 (12)	20.0 (2)	<0.01§	0.66
Heart rate monitors	0.0 (0)	0.0 (0)	10.0 (1)	0.276	0.27
GPS	0.0 (0)	7.1 (1)	0.0 (0)	0.462	0.21

[A]For "communication", "training control" and "equipment provided" items, percentages within competitive level (1st, 2nd and 3rd/4th divisions) represent a "yes" answer relative to a "no" answer. * Cycle ergometer and treadmill. **PVC plates, dumbbell rod, curl rod, and medicine ball. § p<0.05. ES = effect size (Cramer's V test).

The majority of fitness coaches (all male and female categories) reported using periodised training strategies during the period of SD, in which the training mode involved individual and collective monitoring. The period of SD precluded the physical evaluation of players since few evaluations were applied during this period. Muscle strength, strength-

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endurance, and aerobic capacity were the main physical training variables. It should be noted that training of muscle strength presented a higher proportion for male professional players than youth players (X^2= 8.233, p= 0.041), as well as training for anaerobic capacity had a higher proportion for male professional players than male youth players and female players (X^2= 16.340, p= 0.001). Training load was controlled using the number of series/repetitions and exercise time, while effort perception scales or questionnaires mainly verified the training response. Other instruments such as pain, fatigue, recovery, welfare, sleep, and mood scales presented low use. The total number of specific training (balls drills) was small during the period of SD for COVID-19 (Table 3).

Table 3. Training characteristics during SD for COVID-19.

	Male players		**Female players**			
	Professional % (n)	**Youth** % (n)	**Professional** % (n)	**Youth** % (n)	**p-value**	**ES**
Periodization						
Yes	80.5 (33)	87.5 (21)	70.0 (7)	85.7 (6)	0.666	0.14
No	19.5 (8)	12.5 (3)	30.0 (3)	14.3 (1)		
Training mode						
Individual	12.2 (5)	0.0 (0)	10.0 (1)	0.0 (0)		
Collective	19.5 (8)	50.0 (12)	40.0 (4)	14.3 (1)	0.092	0.26
Both	68.3 (28)	50.0 (12)	50.0 (5)	85.7 (6)		
Evaluation						
None	90.2 (37)	79.2 (19)	100.0 (10)	85.7 (6)		
Questionnaires/scales	4.9 (2)	12.5 (3)	0.0 (0)	0.0 (0)	0.360	0.23
Anthropometric	2.4 (1)	8.3 (2)	0.0 (0)	0.0 (0)		
Physical performance	2.4 (1)	0.0 (0)	0.0 (0)	14.3 (1)		
Physical fitness[A]						
Muscle Strength	90.2 (37)	70.8 (17)	100.0 (10)	100.0 (7)	0.041[§]	0.32
Aerobic capacity	87.8 (36)	83.3 (20)	90.0 (9)	71.4 (5)	0.674	0.14
Anaerobic capacity	85.4 (35)	45.8 (11)	50.0 (5)	28.6 (2)	0.001[§]	0.45
Strength-endurance	82.9 (34)	75.0 (18)	100.0 (10)	85.7 (6)	0.367	0.20
Muscle power	80.5 (33)	50.0 (12)	70.0 (7)	57.1 (4)	0.074	0.29
Coordination	70.7 (29)	79.2 (19)	60.0 (6)	71.4 (5)	0.715	0.13
Agility	58.5 (24)	45.8 (11)	60.0 (6)	85.7 (6)	0.301	0.21
Speed	48.8 (20)	33.3 (8)	40.0 (4)	28.6 (2)	0.563	0.16
Speed-endurance	43.9 (18)	20.8 (5)	40.0 (4)	28.6 (2)	0.289	0.21
Sprints	34.1 (14)	45.8 (11)	30.0 (3)	28.6 (2)	0.712	0.13
Training load[A]						
Number of series	95.1 (39)	91.7 (22)	100.0 (10)	100.0 (7)	0.685	0.14
Resistance load*	63.4 (26)	29.2 (7)	60.0 (6)	57.1 (4)	0.058	0.30
Distance covered	46.3 (19)	16.7 (4)	30.0 (3)	28.6 (2)	0.105	0.27
Speed	24.4 (10)	25.0 (6)	20.0 (2)	14.3 (1)	0.931	0.07
Time/repetitions	92.7 (38)	87.5 (21)	100.0 (10)	100.0 (7)	0.514	0.17
Training response[A]						
Effort perception	87.8 (36)	79.2 (19)	100.0 (10)	71.4 (5)	0.291	0.21

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Heart rate	7.3 (3)	0.0 (0)	100.0 (10)	100.0 (7)	0.374	0.20
Questionnaire/scales**	90.2 (37)	95.8 (23)	100.0 (10)	100.0 (7)	0.528	0.16
Training with ball						
Yes	36.6 (15)	37.5 (9)	40.0 (4)	57.1 (4)	0.708	0.13
No	61.0 (25)	58.3 (14)	60.0 (6)	42.9 (3)		
Perception scales						
None	68.3 (28)	79.2 (19)	60.0 (6)	85.7 (6)		
Pain/Fatigue/Recovery	14.6 (6)	12.5 (3)	30.0 (3)	0.0 (0)	0.722	0.16
Welfare/Sleep/Humor	17.1 (7)	8.3 (2)	10.0 (1)	14.3 (1)		

[A]For "physical fitness", "training load" and "training response" items, percentages within age categories (professional or youth) for male and female professional teams represent a "yes" answer relative to a "no" answer. * e.g. 1RM. ** Specific questionnaires to training response. [§]$p<0.05$. ES = effect size (Cramer's V test).

Considering the men's professional teams, Table 4 shows similar training control by fitness coaches in all Brazilian divisions (1st, 2nd, 3rd, and 4th). Training to improve strength-endurance presented a higher proportion for players who compete in the 1st and 2nd divisions compared to players who compete in the 3rd and 4th divisions ($X^2= 6.583$, $p=0.037$). Similarly, coordination was more commonly trained by the 1st and 2nd division teams than teams from the 3rd and 4th divisions ($X^2= 7.999$, $p= 0.018$). The coaches reported five male injured players and three female injured players. The injured body regions were knee (3), pubis (2), hamstrings (1), and lower back (2).

Regarding approval of the new training mode, 95.1% of men's professional teams and 95.8% of the youth teams accepted and performed the training sessions. For the women's professional and youth teams, 50.0% and 57.2% accepted the training during the period of SD for COVID-19, respectively. Regarding the technologies and training performed during the SD period, 59.8% of fitness coaches would use it in the future with no pandemic conditions, while 32.9% would not use it, and 7.3% replied that they might use it.

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Table 4. Training characteristics during SD for COVID-19 among male professional teams.

	Men's Divisions				
	1st division n= 11 % (n)	**2nd division n= 14** % (n)	**3rd/4th divisions n= 10** % (n)	**p-value**	**ES**
Periodisation					
Yes	81.8 (9)	85.7 (12)	60.0 (6)	0.303	0.26
No	16.7 (2)	11.1 (2)	40.0 (4)		
Training mode					
Individual	27.3 (3)	0.0 (0)	20.0 (2)	0.301	0.26
Collective	18.2 (2)	28.6 (4)	10.0 (1)		
Both	54.5 (6)	71.4 (10)	70.0 (7)		
Evaluation					
None	81.8 (9)	92.9 (13)	90.0 (9)		
Questionnaires/scales	9.1 (1)	7.1 (1)	0.0 (0)	0.468	0.28
Anthropometric	9.1 (1)	0.0 (0)	0.0 (0)		
Physical performance	0.0 (0)	0.0 (0)	10.0 (1)		
Physical fitness[A]					
Muscle Strength	100.0 (11)	92.9 (13)	70.0 (7)	0.079	0.38
Aerobic capacity	90.9 (10)	85.7 (12)	90.0 (9)	0.908	0.07
Anaerobic capacity	90.9 (10)	92.9 (13)	70.0 (7)	0.241	0.28
Strength-endurance	81.8 (9)	100.0 (14)	60.0 (6)	0.037[§]	0.43
Muscle power	90.9 (10)	92.9 (13)	70.0 (7)	0.241	0.29
Coordination	72.7 (8)	92.9 (13)	40.0 (4)	0.018[§]	0.48
Agility	72.7 (8)	57.1 (8)	50.0 (5)	0.547	0.19
Speed	63.6 (7)	35.7 (5)	60.0 (6)	0.311	0.26
Speed-endurance	27.3 (3)	64.3 (9)	40.0 (4)	0.167	0.32
Sprints	36.4 (4)	42.9 (6)	20.0 (2)	0.501	0.20
Training load[A]					
Number of series	100.0 (11)	92.9 (13)	90.0 (9)	0.588	0.17
Resistance load*	63.6 (7)	71.4 (10)	60.0 (6)	0.832	0.10
Distance covered	54.5 (6)	42.9 (6)	40.0 (4)	0.770	0.12
Speed	36.4 (4)	28.6 (4)	10.0 (1)	0.367	0.24
Time/repetitions	100.0 (11)	85.7 (12)	90.0 (9)	0.440	0.22
Training response[A]					
Effort perception	72.7 (8)	85.7 (12)	100.0 (10)	0.204	0.30
Heart rate	0.0 (0)	14.3 (2)	10.0 (1)	0.440	0.22
Questionnaire/scales**	90.9 (10)	92.9 (13)	90.0 (9)	0.967	0.04
Training with ball					
Yes	63.6 (7)	42.9 (6)	20.0 (2)	0.131	0.34
No	36.4 (4)	57.1 (8)	80.0 (8)		
Perception scales					
None	72.7 (8)	71.4 (10)	60.0 (6)		
Pain/Fatigue/Recovery	18.2 (2)	7.1 (1)	20.0 (2)	0.807	0.15
Welfare/Sleep/Mood	9.1 (1)	21.4 (3)	20.0 (2)		

[A]For "physical fitness", "training load" and "training response" items, percentages within competitive level (1st, 2nd and 3rd/4th divisions) in male professional teams represent a "yes" answer relative to a "no" answer. * e.g. 1RM. ** Specific questionnaires to training response. [§]$p<0.05$. ES = effect size (Cramer's V test).

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DISCUSSION

The aim of the present study was to investigate the communication/training strategies and technologies used by Brazilian football fitness coaches (professional and youth teams) during the period of SD provoked by COVID-19. To the best of our knowledge, this is the only study to assess the training conditions of Brazilian football players during the SD period provoked by COVID-19. Our main findings revealed that (i) fitness coaches preferred to communicate daily with their players through message apps and use online spreadsheets to control the training regardless of age, competitive level and sex; (ii) male professional teams from the 1st and 2nd divisions provided more access to equipment to their players than female (regardless of age) and male professional 3rd/4th division and youth teams; (iii) the provision of equipment for strength was higher in the 1st and 2nd division teams than 3rd/4th ones; (iv) muscle strength, strength-endurance and aerobic capacity were among the main physical qualities targeted by fitness coaches; of interest, more emphasis on muscle strength and anaerobic capacity was reported in male professional than in youth football teams, while strength-endurance and coordination qualities were more targeted at 1st and 2nd division than in 3rd/4th division teams. Thus, our hypothesis was partially supported showing that male professional football teams from the 1st and 2nd divisions presented better conditions to home-based physical training than female teams and other competitive levels. It is important to highlight that during the game break, some football players attended the club training centre, but in the present study, we only consider data on home-based training. It is noteworthy that 55% and 62.5% of male and female football teams which competed in the Brazilian 1st division, respectively, participated in the present study. In addition, a high number of youth team fitness coaches answered the online form. Therefore, we believe that our results can be extrapolated to other Brazilian football teams.

Manuscript Draft

The COVID-19 pandemic has had significant consequences for football players, including a lack of organised training and competition, inappropriate training conditions, and inadequate communication between players and coaches (Chen et al., 2020; Jukic et al., 2020). Therefore, during the lockdown for COVID-19, remote communication and training methods (i.e., written and voice messages and face-to-face online meetings) were used by Brazilian teams (Table 1), and approximately 95% and 54% of male and female players accepted this method for communication and training, respectively. These results may be related to the growth of smartphone users, free message apps, and online group meetings, especially during the lockdown of the COVID-19 pandemic (Jakhar et al., 2020). On the other hand, although the relationship between coaches and players is an essential variable in team sports (Côté & Gilbert, 2009), a previous study showed that remote communication can preclude human relationships (Przybylski & Weinstein, 2012). However, considering a specific condition provoked by COVID-19, Li et al. (2020) demonstrated that remote face-to-face communication improved relationships between coaches and young football players.

In the pandemic scenario, home-based physical training is recommended (Hammami et al., 2020); thus, some suggestions for football players have been proposed in the literature to guarantee a safe and successful return to playing matches (Jukic et al., 2020; Mohr et al., 2020; Mon-López et al., 2020). In general, for non-athletes, moderate home-based exercise is sufficient to maintain physical fitness (Izquierdo et al., 2007); however, for athletes, high-level activities are necessary (Koundourakis et al., 2014). The absence of appropriate space, the inability to perform specific football actions, and inadequate equipment are among the main barriers for fitness coaches to develop home-based training (Jukic et al., 2020). In this context, young Brazilian players and female players seem to be most affected since male professional players receive more equipment provided by the club (Table 1). Furthermore, players who compete in the 1st and 2nd divisions received equipment for training, while most

Manuscript Draft

players who compete in the 3rd and 4th divisions did not receive any equipment for training. These findings are in agreement with those reported by Washif et al. (2022), who also demonstrated that more professional (55% and 71%) than amateur (45% and 63%) players had the necessary equipment to perform strength and cardiovascular training at home, respectively. This latter study also found that most professional players received training programs prescribed by their coach/trainer (53%), while amateur (59%) and semi-pro (47%) players programmed their own training regimens. Taken together, these results reinforce that financial investment differences between professional and youth teams, male and female teams, 1st/2nd divisions and 3rd/4th divisions may distinctly impact the access to equipment for training and supervised training prescription.

The importance of training periodisation is well known and accepted for athletes (Buchheit & Laursen, 2013; Issurin, 2010). In this context, the majority of fitness coaches (professional and youth, male and female) performed a home-based physical training periodisation in order to reach an ideal physical condition to return to matches. However, as the exact date for the return to football was indefinite (Mohr et al., 2020), the periodisation became a "shot in the dark". Therefore, although fitness coaches contacted players daily to assess load and response to the exercises prescribed, they could not monitor changes in physical capacities and recovery during home-based training since most fitness coaches did not apply physical evaluation or perception scales (Tables 3 and 4).

In some conditions involving non-competitive periods such as off-season (i.e., vacations) or injuries, football players can experience physical detraining, which involves partial or total loss of previously acquired training adaptations (Mujika & Padilla, 2001). However, during the period of SD caused by COVID-19, the detraining experienced by players could be more harmful since home confinement can lead to several negative behaviours, for example, inappropriate nutrition, poor sleep quality, loneliness, physical

Manuscript Draft

activity reduction, increase in time spent sitting, and, mainly, the decrease in specific physical fitness (Hammami et al., 2020; Jukic et al., 2020). Therefore, it appears that although home-based training cannot replace training on the football pitch during non-pandemic conditions, it was the only alternative in an attempt to maintain the physical fitness of Brazilian football players.

Taking into account the real possibilities of home-based training, practitioners and fitness coaches were challenged to design a training program that would allow players to return to their regular training activities with minimum acceptable levels of physical fitness since it was expected that confinement for COVID-19 would induce a loss in physical fitness and increased match-related fatigue and injury risks for football players (Mohr et al., 2020). In Brazil, the present study showed that the training prescription was aimed at improving key physical qualities in football, such as muscle strength, strength-endurance, and aerobic fitness. Our data are in line with an earlier study whose results also revealed that most players trained to maintain or develop general fitness and health regardless of competitive level, with professional players having more training targeted to maintain or develop strength and power (e.g., plyometric drills), muscular endurance, muscle balance and weight management than amateurs or semi-professional players (Washif et al., 2022). More attention to these physical capabilities seems logical because a long detraining period can negatively impact the functions of the neuromuscular and cardiorespiratory systems (Jukic et al., 2020). Considering that lockdown could last longer than 4 weeks, our data highlight that the main concerns of fitness coaches were to minimise undesired changes related to detraining, such as a decline in maximal oxygen uptake, blood volume, total haemoglobin content, muscle capillarisation, muscle mass, and reduced strength ability (Neufer et al., 1987; Wang & Pessin, 2013). Regarding these efforts to maintain physical conditioning, a study by Grazioli et al. (2020) showed that male professional football players did not demonstrate differences in hamstring

Manuscript Draft

eccentric strength, squat jump height, and cardiorespiratory fitness compared to pre-season values. However, negative changes in the body composition, countermovement jump, and 10m and 20m sprint times occurred after quarantine. This finding suggests that superior decrements in power-speed-related abilities could be mainly attributed to the absence of appropriate training facilities for developing these physical components during confinement at home.

Most players did not perform specific football training (i.e., ball drills) during the lockdown caused by COVID-19. Small-sided games are a common high intensity training method to improve physical and endurance fitness (Buchheit & Laurse, 2013). However, small-sided games were made impossible during forced confinement due to COVID-19 because at least two players and an appropriate space were needed. According to Mohr et al. (2020), the lack of high intensity stimuli is harmful to the high intensity performance of players during football matches, and the unexpected playing pause can result in high bio-physiological load after confinement, since the time to build up ideal physical fitness was limited.

In addition to football training load reduction, athletes could be more susceptible to injury occurrence after the SD period for COVID-19 (Mohr et al., 2020). Although home-based training is less demanding in terms of intensity and volume than regular and traditional football training (Jukic et al., 2020), non-contact injuries were reported in the knee, pubis, hamstrings, and lower back. These sites already present a high incidence of injury in football players (Pfirrmann et al., 2016). Noncontact injuries are known to present multifactorial factors, such as fatigue (training and matches), muscle imbalance, fitness, and movement efficiency (McCall et al., 2014). Considering that players reported the occurrence of injuries, we believe that injury prevalence during confinement for COVID-19 may be underestimated for youth and men's professional players of the 3rd and 4th divisions.

Manuscript Draft

Almost all Brazilian football players accepted the home-based training during the special conditions arising from the COVID-19 pandemic. Although physical training depends on the presence of the fitness coach, some individuals reported that technologies and strategies used during the SD period could be used in the future, especially in possible SD conditions. Finally, the results of the present study could be helpful for fitness coaches and managers by providing information on the different possibilities, acceptance, and equipment necessary for football players to train during special conditions that preclude in-person training. For instance, our data can assist sports organisations in developing their own technological system to better implement strategies for strength and conditioning practices remotely and online during sports disruption periods according to the population's features and competitive level. Future research should explore methods for better integrating home-based physical training into the sports science context during either sports restrictions or off-season periods. This study is not without limitations. Subjective questionnaires were used to obtain responses from fitness coaches retrospectively and, therefore, subject to recall bias. Here, we considered a convenience sampling approach that limits the generalisability of our findings. Furthermore, a qualitative analysis through interviews might address more detailed (or specific) issues of fitness coaches from a different perspective of performance.

CONCLUSION

In the context of sport and training, fitness coaches preferred to communicate daily with their players through message apps and use online spreadsheets to control the training. Furthermore, fitness coaches (and their players) of the men's football teams of the 3rd/4th Brazilian division and professional female and youth teams were more impacted by the COVID-19 lockdown regarding training conditions than those professionals who worked at 1st and 2nd division football teams. At home, training goals shifted to soccer-related physical

Manuscript Draft

qualities depending on age (i.e., muscle strength and anaerobic capacity being more prevalent in professional teams) and competitive level (strength-endurance and coordination qualities more targeted at 1st and 2nd division teams).

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