RBFEx
ISSN Online: 2675-1372

Revista Brasileira de Fisiologia do Exercício

Review article

Home training recommendations for soccer players during the COVID-19 pandemic

Recomendações de treinamento doméstico para jogadores de futebol durante a pandemia de COVID-19

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ABSTRACT

This pandemic of COVID-19 has a major impact on people's lives, and several governments ordered extended quarantine and requested social isolation to contain the spread of COVID-19 and flatten its contagion curve. Soccer practice was also severely affected by these pandemic effects, including the postponement of several championships, which involve large audiences. In Brazil, the professional leagues restart the official matches (e.g., Brazilian National Fourth, Third, Second, and First Divisions Leagues). However, some youth academies have not yet restarted their professional activities. Therefore, home-based training can be a good option in these cases. Here, we outline the benefits of home workouts using a multidimensional approach. First, we provide practical recommendations for physical, psychological, and tactical training. Next, we propose an example of a home training program spanning one weekly microcycle for soccer players, using load control based on the rating of perceived exertion. We highlighted that is crucial to make all these exercises fun and entertaining during the self-isolation period. The home training recommendations discussed and proposed in this research can and should be adjusted by the coaches according to their own ideas and athletes' access to equipment (e.g., treadmills, flywheel training, virtual reality).

Keywords: viral disease; coronavirus; sport; COVID-19; prevention.

RESUMO

A pandemia da COVID-19 tem um grande impacto na vida das pessoas, e vários governos ordenaram a quarentena estendida e solicitaram o isolamento social para conter a disseminação do vírus e reduzir sua curva de contágio. A prática do futebol também foi gravemente afetada por esses efeitos pandêmicos, incluindo o adiamento de vários campeonatos, que envolvem grandes públicos. No Brasil, as ligas profissionais reiniciaram as partidas oficiais (por exemplo, Campeonatos Brasileiros – todas as divisões). No entanto, algumas academias de jovens ainda não reiniciaram suas atividades presenciais. Portanto, o treinamento no ambiente doméstico pode ser uma boa opção nesses casos. Neste artigo, destacamos os benefícios dos exercícios em casa usando uma abordagem multidimensional. Primeiro, fornecemos recomendações práticas para treinamento físico, psicológico e tático. A seguir, propomos um exemplo de um programa de treinamento no ambiente doméstico abrangendo um microciclo semanal para jogadores de futebol, usando o controle de carga com base na percepção subjetiva do esforço. Destacamos que é fundamental tornar todos esses exercícios divertidos durante o período de isolamento social. As recomendações de treinamento no ambiente doméstico discutidas e propostas nesta pesquisa podem e devem ser ajustadas pelos treinadores de acordo com suas próprias ideias e o acesso dos atletas aos equipamentos (por exemplo, esteiras, realidade virtual).

Palavras-chave: doença viral; coronavírus; esporte; COVID-19; prevenção.

Received: October 27, 2020; Accepted: September 8, 2021.

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Introduction

The new coronavirus (COVID-19) is an infectious disease caused by a newly discovered virus (SARS-CoV-2). On September 21st 2021, the World Health Organization (WHO) presented in its report that the cumulative number of cases reported globally now is fast approaching 228 million and the number of deaths exceeds 4.6 million [1]. This pandemic has a major impact on people's lives, and several governments ordered extended quarantine and requested social isolation to contain the spread of COVID-19 and flatten its contagion curve.

Soccer practice was also affected by these pandemic effects, including the postponement of several championships, which involve large audiences. For instance, this resulted in shutting down national and state tournaments around the world. Consequently, stoppage can result in a detraining process (i.e., the principle of reversibility of sports training), such as a decrease in physical performance and competitive performance [2]. Moreover, this process will be also dangerous for the players in the moment of returning to matches, mainly considering the abrupt spikes in the load that may occur in a very short term (from quarantine to competitive congested fixture periods). For this reason, preventive exercises are recommended during the quarantine in order to minimize injuries in the return to the training activities [3-5]. Thinking of minimizing the abrupt return process and its associated risks, players from several countries (e.g. Brazil, Argentina) that have declared quarantine have adopted home training strategies. In Brazil, most professional leagues restart the official matches (e.g. Brazilian National Fourth, Third, Second, and First Divisions Leagues). However, some of the youth academies have not yet restarted their professional activities. Therefore, home-based training can be a good option in these cases.

Previous studies provided home-based recommendations specially for non-athletes [6-8]. These training sessions usually are performed with body weight and/or with little equipment, in different spaces of the house like rooms, balconies and backyards. Exercises include muscle strengthening, balance activities, motor control/coordination, stretching or a mixed combination of these conditional and coordinative capacities. However, these practices should be adapted for youth and professional athletes, (e.g. soccer players). Furthermore, home training should provide mental, psychological, and tactical-technical stimulus for soccer players during this self-isolation period. In this research, we outline the benefits of home workouts using a multidimensional approach (e.g., physical, psychological and technical-tactical stimulus). We first provide practical recommendations for physical training (Table I) and for psychological and tactical training (Table II). Next, we propose an example of home training program spanning one weekly microcycle for soccer players (Chart I).

Home physical training recommendations for soccer players

Considering the scientific evidence, practical and effective training approaches can be conducted in-home aiming to mitigate the detrimental effects of qua-

rantine. More specifically in relation to soccer, the type of training that most closely matches soccer's specific physiological demands is high-intensity interval training (HIIT) [9]. Despite HIIT training can be conducted in different ways (e.g., running--based, indoor cycling), some researchers propose a training model with body weight using HIIT [10,11]. Additionally, to prescribe HIIT training for metabolic workout, other fitness variables as speed, strength and power can be also developed in this quarantine context using adjusted strategies (e.g., HIIT bodywork, jumps squats, straight-line run [5 m]) [11]. The metabolic responses of the immune system vary according to the HIIT protocol, level of training and availability of energy reserves [12,13]. In addition, after three sessions of HIIT, a positive immunological adaptation occurs in 48 hours intervals of between sessions [13]. Thus, for well-conditioned athletes, it is very unlikely that the HIIT protocols will result in a relevant immune suppression.

One of the most practical and beneficial strategy to use in "home training" is plyometric training, since there is a great demand for eccentric force when performing jumps and it is closely related with multiple benefits for sports-related performance, e.g., speed, strength and power [14,15]. There are a wide variety of exercises for that demand, including jump against movement [CMJ], "dropbox" deep jump, with body weight, unilateral jumps, and light load jumps [16]. The benefits of these training strategies are observed for both young and professional players as they promote an increase in neuromuscular strength, aerobic performance, change of direction, kick and sprinting speed [17,18].

Considering the current unique scenario, we selected training means and methods with the scientific evidence of their potential in maintaining intermittent endurance, muscle power, muscular strength, and flexibility, which are specific for soccer players during the self-isolation period (Table I). Therefore, coaches can use this material to help players in some insights in the prescription of "remote" training for young and professional athletes.

Home psychological and tactical training recommendations for soccer players

We can assume that self-isolation has changed routine and life habits of soccer players, which would affect the components associated to tactics such as cognition and psychology. In fact, it is more likely that self-isolation will have led to the consumption of more medias for longer duration, and it can be detrimental to decision--making performance of players. Previous studies showed evidence of mental fatigue created by the use of smartphones or similar electronic devices on the quality of decision-making [24,25]. Despite the absence of these effects on actual play, we also recommend not to use social networks in smartphones or playing video games prior to the exercises involving perceptual and cognitive skills to optimize performance and limit the usage to the videos related to past performances. Note that this also reflects the opportunity to create this good habit in view of the moment competitions resume. Despite the availability of many games or similar activities that require mental ac-

Table I - Home physical training recommendations for soccer players

Physical Variable	Study	Original sample	Original protocols	Home training recommendations						
				Workouts	Weekly frequency	Sets	Repetitions	Rest (sec)	Session duration (min)	RPE (a.u.)
Intermittent endurance	Rabbani *et al.* [19]	Semi-professional	2x3 min (15´´ high intensity and 15´´ interval)	Stationary run; Mountain climbers; Quick feet forward and back; Quick feet and outs	2-3	20-30	30´´	30´´ passive	~20-30´	8-10 All-out
Muscular power	Michailidis *et al.* [20]	Young athletes	4 exercises performed in 2 to 4 sets (separated by rest intervals of 90 to 180 seconds) of 5 to 10 repetitions per set	Explosive action high execution speed (double and/or single leg): Ski jump; vertical/horizontal jumps; lateral bound; split jumps; drop jumps; jumps + straight line (5 meters)	2-3	2-4	4-8	120´´ passive	~30-40´	5-7
Muscular strength	Loturco, Ugrinowitsch [21]	Profissional	Half-squat exercise during first 3 weeks: wk1 – 4 sets × 8 rep (50% 1RM); wk2 - 4 sets × 8 rep (65% 1RM); wk3 - 4 sets × 8 rep (80% 1RM)	Nordic; Reverse Nordic; Push up; Squats; Steps up on bench; calf exercises; Copenhagen Adduction exercise	2-3	2-4	8-12	90´´ passive	~30-40´	5-7
Accelerations/ decelerations	Buchheit and Laursen [22]	Profissional	Straight line, change-of-direction (COD), COD + jump	Straight line (5-10 meters), COD (10-15 meters)	2-3	Until self-perceived loss of speed	Until self-perceived loss of speed	90´´ passive	~15-20´	8-10 All-out
Flexibility	Oliveira *et al.* [23]	Young athletes	Each series of exercises was composed of 30s of maintenance in the elongated position, followed by a 30s interval	Static stretching; passive stretching; ballistic stretching; proprioceptive neuromuscular facilitation (FNP)	2-3	2-3	2-3	30" passive	~15-20´	2-5

1RM = One-repetition maximum; a.u. = Arbitrary Units; RPE = Rating of percived exertion

tivity, tasks in relation to training and playing soccer are less likely to be performed. Happily, we can also see players and coaches publishing soccer-specific exercises on social medias with limited equipment. However, playing the game requires more than technical and motor training.

Given the relation between action in the play and decision-making activated with cognitive mechanisms [26], it is important to maintain cognitive-perceptual skills alive throughout the period of inactivity. Exercises that require challenge perception and cognition can be created with and without technological or expensive material. For instance, it is possible to mimic cognitive tasks activated with material as Fitlight TrainerTM (Speed & Agility Training | FitLight Trainer™ n.d.) using simpler material, aiming to combine kinematic reactions to stimuli [27]. In its simplest form, a possible corresponding exercise would consist in throwing objects (e.g. balls, cones) of different shapes or colors and require catching/hitting the ones of a same shape or color before they fall on the ground. The same logic can be applied to technical drills where the movement is performed according to a signal. The authors of the review cover more equipment that may be owned by some families, but not by a majority. Hence, stimulating quick perception with household equipment may be possible with a hint of creativity and could add on the physical exercises previously listed.

However, the game is played in cooperation with – and opposition against more players [28]. According to this concept of the game, players need to perform tactical actions in the play, making the game itself the only most representative context of play to train these actions. However, in the contemporary literature in this area, there are various activities that have the potential to bring small but valuable improvement to actions in the play and to their tactical accuracy [29]. Different from the physical training, tactical exercises performed out of the field would consist in: 1) criticizing his own actions; 2) enacting experienced actions; and 3) debating "ideas of the play" using team organization, game model and strategy references. Such activities require mental imagery or video, which are two mediums accessible to everybody in home.

Both the self-confrontation and explicitation interviews are usually guided by qualified researchers or professionals. Although, it is possible to offer to a companion a satisfying experience and lead him to bring back significant information back to consciousness. The principles of interviews are to describe the lived experience as if you lived it again without deliberately seeking for details or memories [30]. This practically helps focusing on actions, including thoughts or even perceptions. As the name suggests, the interviews are interesting to do in tandem, where a companion will question the interviewee. In contrast, debates can be done with more persons as long as everybody stays involved [31]. It is also important to keep a clear reference throughout the conversation, which in that case can be the objective that the team must pursue. For instance, the group could focus on how to reorganize in transitions in respect with principles of play.

Table II presented some recommendations for home psychological and tactical training for young and professional players. Tactical exercises can bridge with coaches' analyzing duty. Thus, it is important to keep the exercises fun for players whilst making them as useful as possible. A way to make sure of this is following mental imagery with corresponding technical exercises. This may pay more than just imaging as in line with embodied cognition/decision-making frameworks, it is more useful for learning to perform actions. Plus, it gives a context to the rehearsal of technical movements. In addition, enacting past experiences and performance during imagery may help more than emulating fictive experiences as it reinforces social links through memories and makes the activity. Accordingly, it is crucial to make all these exercises fun and entertaining during the self-isolation period.

Table II - Recommendations for home psychological and tactical training in young and professional soccer players

Ability variable	Study	Original protocols	Recommendations for home workouts
Perceptual-cognitive skills	Appelbaum and Erickson [27]		Combine a simple movement with a stimulus to react to Can also be mixed with physical exercises
Technique and cognition	Appelbaum and Erickson [27]		Combine a technical drill with a stimulus to react to Can also be mixed with physical exercises
Own performance	Kermarrec *et al.* [32], Sève *et al.* [33]	"Self-confrontation" [34]	Watch a performance experienced in the past and comment your own action from a few seconds before to a few seconds after touching the ball. Operate for more significant actions with the ball or even actions without the ball
Judgment in complex situations	Gesbert *et al.*[35], Mouchet and Bouthier [36], Light *et al.* [37]	Explicitation interview [38]	Watch a performance experienced in the past one time only and mentally enact the action in respect with your memories, seeing it from your own eyes. Describe your feelings as you slow the actions down
Debates	Gréhaigne [31], Caty *et al.* [39]		Watch a performance experienced in the past and discuss with peers the ideas of the play taking coach's directives, game model or strategy as a reference

Despite a lack of scientific data related to the effects of home psychological, tactical, and physical training in soccer players, relevant insights can be gained through discussions between previous ideas reported in Table I and II, and expert coaches who resolve this scenario in their clubs. Also, coaches must calculate the training load (e.g., rating of perceived exertion (RPE) * session duration [min]) and

week monotony (average weekly training load / standard deviation of weekly training load) [40]. Usually, monotony values should be between 0.8-2.0. Here, an example of home training programming over one weekly microcycle is provided in Chart I.

Practical application

- Home physical training recommendations for soccer players should consider intermittent endurance, muscular power, muscular strength, accelerations/decelerations, and flexibility (see Table I).
- Perceptual-cognitive skills, technique, cognition, own performance, judgment in complex situations, and debates are excellent options to home psychological and tactical training (see Table II).
- Rating of perceived exertion (including week monotony) should be considered to load control during microcycles. Here, we provide an example of a home training program spanning (see Chart I).
- We also recommend not to use social networks in smartphones or playing video games prior to the exercises involving perceptual and cognitive skills to optimize performance and limit the usage to the videos related to past performances. Note that this also reflects the opportunity to create this good habit in view of the moment competitions resume.

Conclusion

The training recommendations described in this research are only suggestions adapted from scientific evidence. Coaches must be creative and adopt a holistic view of workouts home intervention (e.g., physical, psychological, and tactical stimulus). In addition, coaches can adopt a video meeting with the players with the purpose to maintain the relationships and clear possible doubts about the workouts. Such as aforementioned, is crucial to make all these exercises fun and entertaining during the self-isolation period. We also recommend not to use social networks in smartphones or playing video games prior to the exercises involving perceptual and cognitive skills. The home training recommendations discussed and proposed in this research can and should be adjusted by the coaches according to their own ideas and athletes' access to equipment (e.g., treadmills, flywheel training, virtual reality). Finally, these recommendations do not apply to athletes showing any symptoms of COVID-19; in such case, self-isolation and complete rest are mandatory.

Potential conflict of interest
No potential conflicts of interest relevant to this article have been reported.

Financing source
This study was funded, in part, by the Secretaria Nacional de Futebol e Defesa dos Direitos do Torcedor (Programa Academia & Futebol - Edital nº 1 de 2020), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (código de financiamento – 001), Fundação de Apoio à Pesquisa (FAP; Universidade Federal do Espírito Santo), and Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES).

Author contributions
Conception and design of the research: Azevedo AM, Petiot GH, Aquino R. **Writing of the manuscript:** all authors. **Critical review of the manuscript:** all authors. **Publication of the document:** Aquino R.

Chart I - Example of home training programming over one weekly microcycle for soccer players

Microcycle		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Weekly	Monotony (a.u.)
AM	**Workouts**	Combine a movement with a stimulus to react to, e.g. the colored ball--catching exercise. Compete against a companion (3 challenges)	**REST**	Combine a technical drill with a stimulus to react to, e.g. volleys or headers giving a direction according to a cue. Compete against a companion (3 challenges)	**REST**	**REST**	Combine a technical drill with a stimulus to react to, e.g. volleys or headers giving a direction according to a cue. Compete against a companion (3 challenges)	**REST**		
	RPE (a.u.)	3-4		1			5-7			
	Session during (min)	30		30			30			
	TRIMP (a.u.)	90-120		30			150-210			
PM	**Workouts**	**Balance, Flexibility, Hip Mobility** (2x1´each) Shoulder Gators; Knee Hugs Alternating; Dynamic Hamstring Stretching Alternating; World´s Greats Stretch Alternating **Stability/Activation** (3x30´´/30´´ rest) Plank; Airplanes (right and Lift Leg); Balance on a single leg with your eyes closed **Hip Mobility** (2x1´ each) Hip Cradles Alternating; Lateral Hip Openers; Reverse lunge Reaches Alternating	**Muscular Strength, Dynamic Mobility** (2x1´each) Knee Hugs Alternating; Inchworms; World´s Greats Stretch Alternating; Dynamic Chest Stretch; **Stability/ Activation** (3x30´´/30´´ rest) Lateral Plank; **Muscular Strength** (3-4x 8-12/ 90´´ rest) Squat; Push Up; Dynamic Hip Lifts; Nordic; Reverse Nordic; Copenhagen Adduction exercise; Steps up on bench; calf exercises **Flexibility** Static Stretching	**Muscular Power, Dynamic Mobility** (1x1´each) Knee Hugs Alternating; Inchworms; World´s Greats Stretch Alternating; Dynamic Chest Stretch; **Stability/Activation** (3x30´´/30´´ rest) Lateral Plank **Muscular Power** (3-4x 6-8/ 120´´ rest) Explosive action high execution speed (double and/ or single leg): Ski jump; vertical/horizontal jumps; lateral bound; split jumps; drop jumps **Acc/Dess** Run Straight-line (5m with 2m deceleration); Run change-of-direction (3m+3m+3m+3m with 1m deceleration)	**Muscular Strength, Dynamic Mobility** (2x1´each) Knee Hugs Alternating; Inchworms; World´s Greats Stretch Alternating; Dynamic Chest Stretch; **Stability/ Activation** (2x30´´/30´´ rest) Plank; Airplanes (right and Lift Leg); Balance on a single leg with your eyes closed **Muscular Strength** (2-3x 8-10/ 90´´ rest) Squat; Push Up; Dynamic Hip Lifts; Steps up on bench; calf exercises **Flexibility** Static Stretching	**Muscular Power, Dynamic Mobility** (1x1´each) Knee Hugs Alternating; Inchworms; World´s Greats Stretch Alternating; Dynamic Chest Stretch; **Stability/Activation** (3x30´´/30´´ rest) Lateral Plank **Muscular Power** (3-4x 6-8/ 120´´ rest) Explosive action high execution speed (double and/or single leg): Ski jump; vertical/horizontal jumps; lateral bound; split jumps; drop jumps **Acc/Dess** Run Straight (5m with 2m deceleration); Run change-of-direction (3m+3m+3m+3m with 1m deceleration)	**Intermittent Endurance, Dynamic Mobility** (2x1´each) Dynamic Chest Stretch; Hurdle Steps Alternating Knee Hugs Alternating; World´s Greats Stretch Alternating **Stability/Activation** (3x30´´/30´´ rest) Plank Alternative Legs Lifts **Intermittent Endurance** (4x 30´´/ rest 30´´) Run in Place; Quick Feet and outs; Mountain Climbers; Quick Feet Forward and Back; High Knee March; High Skips; Jumping Jacks **Flexibility** Static Stretching	**REST**	1620-2290	1.70-1.86
	RPE (a.u.)	2-4	5-7	5-7	3-5	5-7	8-10			
	Session during (min)	30	60	60	50	60	30			
	TRIMP (a.u.)	60-120	300-420	300-420	150-250	300-420	240-300			

AM = Before midday; PM = After midday; RPE= rating of perceived exertion; a.u. = Arbitrary Units

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