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Review Article

Physical exercise during the COVID-19 pandemic for individuals with a risk factor for cardiovascular disease: benefits and safety

Exercício físico durante a pandemia da COVID-19 para indivíduos com fator de risco para doença cardiovascular: benefícios e segurança

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ABSTRACT

Introduction: Physical exercise is one of the main components of the cardiovascular rehabilitation program (CR). However, due to the social isolation adopted by public authorities because of the new coronavirus pandemic (COVID-19), the performance of RC in an outpatient setting is impractical at this time. **Objective:** To discuss about safe, efficient and pleasant physical exercise strategies for individuals with clinically stable risk factors for cardiovascular disease (CVD), outside the traditional RC environment. **Methods:** Narrative literature review with search of the sources made in Medline databases via PubMed and Scientific Electronic Library Online (SciElo), without date limit, with the key-words: physical exercise, coronavirus, cardiovascular rehabilitation and risk factors for cardiovascular disease, in Portuguese and English. **Results:** 25 articles and 1 book in electronic format were included. **Conclusion:** The physical exercise program improves functional capacity, muscle strength, oxygen perfusion, mental and social status and quality of life, minimizing the negative impact of social isolation on health. Thus, the recommendations suggested in this article are safe measures that bring benefits to individuals with risk factors for CVD.

Keywords: cardiovascular rehabilitation; functional capacity; coronavírus.

RESUMO

Introdução: O exercício físico é um dos principais pilares do programa de reabilitação cardiovascular (RC). Entretanto, devido ao isolamento social adotado pelas autoridades públicas por causa da pandemia da infecção provocada pelo novo coronavírus (COVID-19), a realização de RC em ambiente ambulatorial é impraticável neste momento. **Objetivo:** Discutir sobre estratégias seguras, eficientes e prazerosas de exercícios físicos para indivíduos com fatores de risco para doença cardiovascular (DCV), clinicamente estáveis, fora do ambiente tradicional de RC. **Métodos:** Revisão de literatura narrativa com busca das fontes realizadas nas bases de dados *Medline* via *PubMed* e *Scientific Electronic Library Online* (SciElo), sem limite de data, com as palavras-chave: exercício físico, coronavírus, reabilitação cardiovascular e fatores de risco para doença cardiovascular, em português e inglês. **Resultados:** Foram incluídos 25 artigos e 1 livro no formato eletrônico. **Conclusão:** O programa de exercício físico provoca melhoras na capacidade funcional, força muscular, perfusão de oxigênio, estado mental e social e a qualidade de vida, minimizando o impacto negativo do isolamento social na saúde. Desta forma, as recomendações sugeridas neste artigo são medidas seguras e que trazem benefícios para indivíduos com fatores de risco para DCV.

Palavras-chave: reabilitação cardiovascular; capacidade funcional; coronavírus.

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Introduction

Patients with risk factors for cardiovascular disease (CVD) (i.e., obesity, systemic arterial hypertension, diabetes mellitus, and dyslipidemia) are eligible for cardiovascular rehabilitation (CR) programs. Outpatient CR involves several components to improve the physical, mental and social health of the participants and must occur under the supervision of a multi-professional team composed of doctors, physiotherapists, Physical Education teachers, nutritionists, psychologists, social workers, and nurses. In this environment, educational activities are carried out on health care in several aspects. Among the activities developed in outpatient CR, physical exercise is one of the main pillars due to its well-pronounced benefits in functional capacity, in the control of risk factors, and the quality of life in this population [1].

However, the social isolation measures certainly adopted by the World Health Organization (WHO) and public authorities due to the pandemic of the new coronavirus infection (COVID-19), caused by SARS-CoV-2, prevent the practice of physical exercises in CR is carried out by security measures of this population. Data presented by the Chinese Center for Disease Control and Prevention point to a lethality rate of 2.3% by COVID-19 (1,023 deaths out of 44,672 confirmed cases). Still, when patients had some risk factors for CVD, such as systemic arterial hypertension or diabetes mellitus, this rate reached 10.5%, which shows that this population is more vulnerable when infected by the virus [2]. This social seclusion can induce sedentary behaviors, favoring an increase in body mass, an increase in systemic blood pressure, greater intolerance to glucose, dyslipidemia, as well as psychosocial disorders such as depression and anxiety [3]. The psychological impact of prolonged quarantine is associated with feelings of anger, frustration, boredom, controversial information (i.e., fake news), and financial losses [4].

Therefore, due to this challenging scenario that will last for a long period, the objective of this article is to discuss the safety of prescription, efficiency and enjoyment of physical exercises for requirements with risk factors for clinically stable CVD (i.e., with optimized medication and no signs/symptoms of uncontrolled blood pressure and/or blood glucose) for the traditional CR environment.

Methods

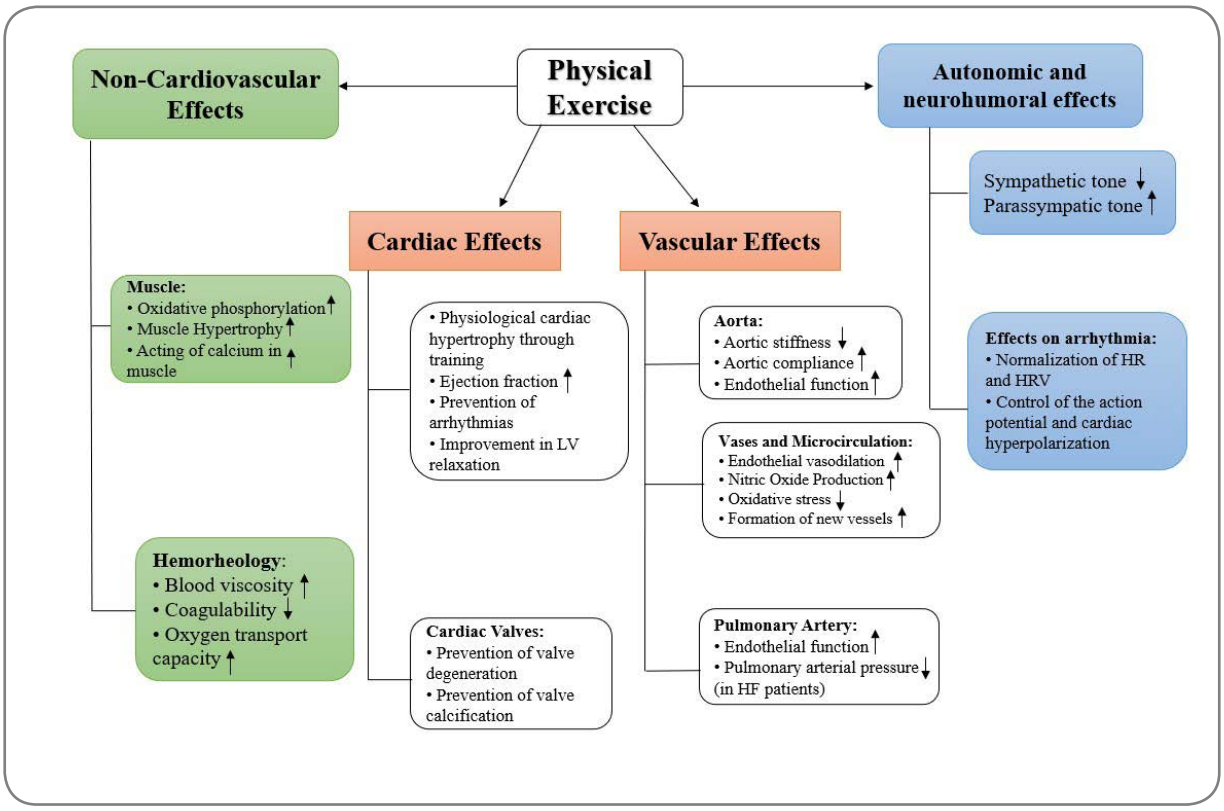
A narrative literature review was carried out with the search for sources made on Medline via PubMed and Scientific Electronic Library Online (SciElo), with no date limit, with the key-words: physical exercise, coronavirus, cardiovascular rehabilitation and risk factors for cardiovascular disease, in Portuguese and English.

Results and discussion

Benefits of physical exercise

If, on the one hand, social isolation is crucial for patients with risk factors for CVD, avoiding greater exposure to the virus, on the other hand, this withdrawal can lead to a reduction in daily physical activities and physical exercise practices [5]. Physical exercise is a way to improve the health of this population, with significant effects on glucose metabolism, on skeletal muscle function, on the respiratory, cardiac, and bone systems [6], on improving mental health [7], on endothelial function, reduced levels of lipoproteins and atherosclerotic lesions [8] and other organs (Figure 1).

Prolonged periods of physical inactivity lead to changes in the sympathovagal modulation and oxidative function of skeletal muscle, resulting in reduced stroke volume and peripheral muscle dysfunction [9]. WHO data from 2016 indicate that 44% of the causes of death worldwide were cardiovascular etiology. When physical inactivity is associated with some heart disease, the risk of mortality increases significantly [10].



HR = Heart rate; HRV = Heart rate variability; HF = Heart failure; LV = Left ventricle. Niebauer J, 1996 [11]; Gielen *et al.*, 2010 [12].

Figure 1 - Effect of physical exercise on the myocardium, blood vessels, and skeletal muscle

In patients with risk factors for CVD, there is a significant improvement in functional capacity, blood pressure, and quality of life with interventions through aerobic and/or strength exercise, with no risk associated with disease progression [13, 14]. A study carried out with 5,641 patients with coronary artery disease sub-

mitted to a CR program concluded that an increase of 1 MET (metabolic equivalent) was able to reduce the risk of cardiovascular mortality by 25% [15]. A recent meta-analysis pointed out that aerobic training combined with strength training improved oxygen consumption at peak effort (VO2peak), muscle strength, and quality of life in patients with heart failure, mainly due to improved transport capacity and use of oxygen by peripheral musculature [16].

Physical exercise at home environment is considered an essential tool for the prevention and treatment of diseases related to physical inactivity, especially in situations where practice outside this environment is not possible [17]. In this sense, even minimal amounts of physical exercise at home environment (e.g., walking for 20 minutes) promote reductions in the risk of mortality from CVD by improving systemic blood pressure and glycemic control [18].

Thus, physical exercise promotes physiological adaptations that increase the perfusion and oxygen supply to the cardiac and skeletal muscle, resulting in improvement of peripheral muscle dysfunction, as a consequence, contributing to the reduction of effort intolerance and risk of cardiovascular mortality in individuals with factors risk factors for CVD [19].

Recommendations for physical exercise prescription

The current Brazilian Cardiovascular Rehabilitation Guideline provides the following recommendations for patients with clinically stable CVD risk factors for physical exercise and will be presented in Chart 1 [1]:

Chart 1 - Recommendations for exercises to improve functional capacity in cardiac patients

Aerobic exercise
✓ Heart rate (HR) between 70% to 90% of the maximum HR obtained in the exercise test, between 50% to 80% of the reserve HR or between the first and the second threshold obtained in the cardiopulmonary exercise test (CPET).
✓ In cases of ischemia detected in the exercise test, exercise should be performed below the ischemic threshold - usually 10 bpm below the HR where clinical and/or electrocardiographic signs of stressed myocardial ischemia are detected.
Resistance exercise
✓ It is recommended 1 to 3 sets of 8 to 15 repetitions per exercise involving the main muscle groups, with progressive loads without, however, reaching the concentric failure, indicative of maximum effort.

Although the recommendations for exercise intensity are based on physiological parameters (i.e., HR), the use of these indices can be difficult to monitor by the patients themselves due to 1) lack of technological resources to monitor HR (e.g., heart rate monitor); 2) lack of knowledge on how to measure HR using the radial pulse and; 3) the influence of the fitness level on the HR response, through sympathovagal modulation, in which the same absolute HR value can represent a different physiological response, according to the individual's fitness level.

As an alternative that is easily accessible and understood by most people, especially when performing physical exercises without direct supervision by a multi-professional team, the intensity of the effort can be controlled by a subjective effort perception scale. Among these scales, the most known and used is the Borg Scale [20], which was originally developed on a scale of 6 to 20 and, alternatively, has a version adapted on a scale of 0 to 10 (Figure 2).

BORG SCALE CR-10 (1990)		
0	Nothing at all	😊
0,5	Extremely weak	😊
1	Very weak	😊
2	Weak (light)	😊
3	Moderate	😐
4		😐
5	Strong (heavy)	😐
6		😐
7	Very strong	☹
8		☹
9		☹
10	Extremely strong	☹

Borg, 1990 [20]
Figure 2 - Borg Scale (scale from 0 to 10)

The use of the Borg Scale is a strategy widely used in exercise tests and the prescription of physical exercise, both for cardiac patients and healthy individuals [21, 22]. The safe training intensity should represent an effort up to 4 (on a scale from 0 to 10), corresponding to the intensity considered moderate. Thus, as a way of controlling the intensity of effort, the Borg Scale is an important control tool for self-monitoring during physical exercises [23].

Thus, the physical exercise program for patients with risk factors for CVD to perform at home should consider the following points:

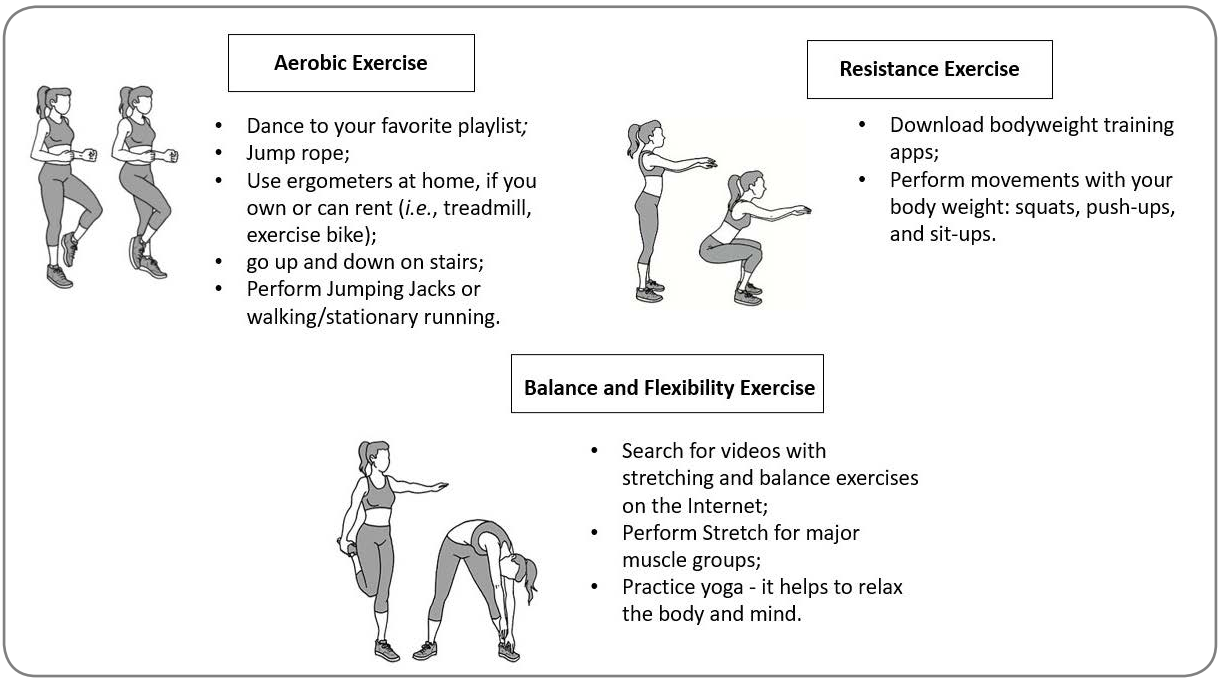
- **Training frequency:** Three to five times a week, respecting the rest interval so that there are no harmful effects on the body due to overtraining.
- **Session duration:** Initially, 20 minutes a day, progressing gradually until reaching 60 minutes a day.
- **Intensity:** HR or Borg Scale, as previously discussed.
- **Modality:** Due to limited resources and space, it is recommended that circuit exercises with their body weight and using home equipment (i.e., chair, broom, bottles).
- **Safety:** It must be ensured that the place does not have objects that can facilitate the fall or cause trauma during the execution of physical exercises (i.e., carpets, furniture, toys). Also, whenever possible, monitor the levels of blood pressure (hypertension) and capillary blood glucose (diabetics) before and after exercise.

The training sessions must consist of: 1) the warm-up phase, to prepare the body for the increase in physiological demand; 2) training itself and; 3) cool down, to help to return physiological parameters to rest indexes.

Physical exercises should be stopped immediately if angina, severe dyspnoea, syncope, and headache are present. However, in the presence of fever, the practice of physical exercise is contraindicated, at least on that day.

Suggested physical exercises to be performed at home

There is a challenge in prescribing physical exercises in the home environment due to the limitation of equipment/resources for the execution of different types of movements and the difficulty in controlling the variables and performing the exercises. Besides, the physical exercise program should promote pleasant experiences for the individual in a way that facilitates their adherence to a daily training routine [24]. With that in mind, the American College of Exercise Medicine (ACSM) and the Brazilian Society of Cardiology (SBC) prepare documents that endorse the importance of staying active during this period and suggestions for exercises that can be performed safely, pleasantly, and efficiently indoors (Figure 3) [23,25]:



Reis *et al.*, 2020 [23]; American College of Sports Medicine, 2020 [25]
Figure 3 - Suggested physical exercises to be performed at home

Bearing in mind that social support is an essential factor for adhering to the physical exercise program, establishing a positive relationship to encourage this practice among family members is crucial for regular training and especially maintenance in this training program [26]. In this way, exercises that involve the spouse, children, and other family members can increase the positive aspects of the training experience and promote greater adherence during the period of pandemic and social isolation [24].

Conclusion

In this context, it is extremely important for patients with risk factors for CVD to remain physically active during the period of social isolation since sedentary behavior causes damage in the clinical and functional framework. The physical exercise program improves functional capacity, muscle strength, oxygen perfusion, mental and social status, and quality of life. Following the guidelines presented in this article can minimize the negative impact of social isolation on health. Thus, the recommendations suggested in this article are safety measures that bring benefits to individuals with risk factors for CVD.

Interest conflicts
The authors declare that they have no conflict of interest.

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Authors' contributions
Conception and design of the research: Souza WMM, Bezerra DVB. **Data collection:** Souza WMM, Bezerra DVB. **Analysis and interpretation of data:** Souza WMM, Bezerra DVB. **Writing of the paper:** Souza WMM, Bezerra DVB, Reis MS. **Critical review of the paper for important intellectual content:** Reis MS.

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