Revista da
SOCESP
Sociedade de Cardiologia do Estado de São Paulo

NON-PHARMACOLOGICAL INTERVENTION IN INDIVIDUAL RISK FACTORS

INTERVENÇÃO NÃO FARMACOLÓGICA EM FATORES DE RISCO DE FORMA INDIVIDUAL

Kátia De Angelis[1]
Maycon Junior Ferreira[1]
Luciana Ferreira Angelo[2]

1. Laboratory of Exercise Physiology, Universidade Federal de São Paulo – UNIFESP, São Paulo, SP, Brazil.
2. Instituto Sedes Sapientiae, São Paulo, SP, Brazil.

Correspondence:
Kátia De Angelis.
Biomedical Sciences Building, 5th floor, Department of Physiology, Laboratory of Exercise Physiology.
Rua Botucatu, nº 862 -
Vila Clementino, São Paulo, SP, Brazil.
prof.kangelis@yahoo.com.br

Received on 10/25/2018,
Accepted on 02/13/2019

ABSTRACT

Lifestyle changes associated with sedentary behavior, unhealthy eating habits and exposure to stressful conditions have increased cardiovascular disease (CVD's) susceptibility. In this regard, the risk of developing diseases that affect individuals of different age groups can be largely attributed to physical inactivity. Conversely, the general consensus is that a physically active life is essential for maintaining cardiovascular health. In fact, exercising has proven effective from both the preventive and therapeutic perspective, characterizing a key approach in the management of conditions and risk factors associated with CVD's, such as obesity, diabetes and dyslipidemia. Moreover, this approach also has positive effects on different behaviors related to inappropriate lifestyle habits, such as an unhealthy diet, smoking, alcoholism and stress. From the psychological perspective, stress manifests in cognitive, emotional, behavioral, social and psychophysiological processes, contributing to the development of CVD's which can produce feelings of insecurity, anxiety and fear, which in turn can lead to dysfunctional health behaviors such as smoking and overeating. In this article, we review the role of a sedentary lifestyle and psychological alterations in CVD's, highlighting evidence in favor of the adoption of preventive and therapeutic approaches to manage these important risk factors.

Keywords: Cardiovascular Diseases; Risk Factors; Disease Prevention; Exercise; Psychology.

RESUMO

Mudanças no estilo de vida associadas ao comportamento sedentário, maus hábitos alimentares e exposição a condições estressantes têm aumentado a suscetibilidade para desenvolvimento de doenças cardiovasculares (DCV's). Neste sentido, atribui-se à inatividade física grande parte do risco de desenvolvimento de doenças que acometem indivíduos de diversas faixas etárias. Em contrapartida, é consenso que a vida fisicamente ativa é essencial para a manutenção da saúde cardiovascular. De fato, a prática de exercícios tem se mostrado efetiva tanto no ponto de vista preventivo quanto terapêutico, caracterizando-se como uma abordagem essencial no manejo de condições e fatores de risco associados às DCV's como obesidade, diabetes e dislipidemia, exercendo ainda efeitos positivos sobre diferentes comportamentos relacionados a hábitos de vida inadequados, como má alimentação, tabagismo, alcoolismo e estresse. Na perspectiva da psicologia, o estresse manifesta-se em processos cognitivos, emocionais, comportamentais, sociais e psicofisiológicos favorecendo o desenvolvimento das DCV's, as quais podem produzir sentimento de insegurança, ansiedade e medo, que podem levar a comportamentos pouco funcionais como fumar e comer em excesso. Neste artigo, revisamos o papel do sedentarismo e de alterações psicológicas nas DCV's, assim como destacamos evidências para a adoção de abordagens preventivas e terapêuticas de manejo destes importantes fatores de risco.

Descritores: *Doenças Cardiovasculares; Fatores de Risco; Prevenção de Doenças; Exercício; Psicologia.*

INTRODUCTION

Cardiovascular disease: contextualizing the problem

Public health is a major challenge in the modern era of the society has undergone a relevant epidemiological transition, which have guided strategies and actions adopted by global health organizations in the public and private spheres. In this sense, it is widely known that cardiovascular diseases (CVDs) are the main cause of death in the world today. Advances in research and improvement in different health sectors, including the emergency system, have shown promising results such as a slight reduction in the CVD-related mortality rate in recent decades in Europe and the United States.[1] Despite this reduction, estimates for the coming years are challenging, thus

 http://dx.doi.org/10.29381/0103-8559/20192902137-45

reinforcing the need for immediate interventions to address this problem mainly in the medium and long term.

The implementation of preventive measures aimed at reducing or even minimizing the incidence and prevalence of CVD in society is essential and of great social and economic importance.[2,3] It is known that the aging of the population and the higher prevalence of risk factors, such as a sedentary lifestyle, poor eating habits, and stress, which are factors that favor the development of CVDs, play an important role in the increase of health expenditures. Moreover, harmful habits, initiated in childhood and adolescence, are associated with a significant portion of health costs and have enormous potential to favor the development of CVDs in adult life, thus greatly influencing future health expenditures. Therefore, changes in lifestyle should be of interest to the public health sector, to better classify the implementation of essentially primary prevention measures that generate promising results in the economic scenario and in the reduction of cardiovascular morbidity and mortality. (Figure 1)

It is worth mentioning that harmful habits are increasingly adopted earlier in life. Excessive alcohol consumption and smoking; the large amount of processed foods consumed daily; the automated, computerized, and stressful work; and the significant reduction in physical activity levels are among some of the major problems present in daily life that negatively affect health, leading to serious consequences in the short, medium, and long term. In fact, modifiable risk factors, such as those mentioned above, are associated with the highest rate of mortality caused by CVDs when compared to non-modifiable risk factors (genetics, ethnicity, age, and gender). In this context, among the modifiable risk factors, physical inactivity is considered relevant for public health owing to its great potential for the development of other risk factors and CVDs.

PHYSICAL INACTIVITY AS A TARGET FOR INTERVENTION

The association between the levels of physical activity and cardiovascular events has been investigated for many years and is currently well established. Concomitantly with studies focusing on the genesis of diseases and associated risk factors, other research groups directed their efforts toward establishing possible relationships which could contribute to and explain a higher cardiovascular mortality rate associated with the level of physical activity. In one of these investigations, Morris et al. (1953) found a direct association between the level of physical activity and heart disease. In this study, the authors found that individuals who worked as bus conductors and postmen in England had a lower incidence of coronary artery disease and a lower mortality rate when compared to drivers and telephone operators, respectively. Such findings are explained by the fact that physical activity was more present in the professional practice of the former, while the latter worked in a predominantly sedentary environment and under continuous exposure to stress.[4] Based on the findings of studies such as this one, an initial relationship can be established between having a more active life and the future risk of developing CVDs. Several other studies over the years have accurately described the benefits of physical activity at work or at leisure for lowering mortality risk. In a recent systematic review with meta-analysis, Patterson et al. evaluated the impact

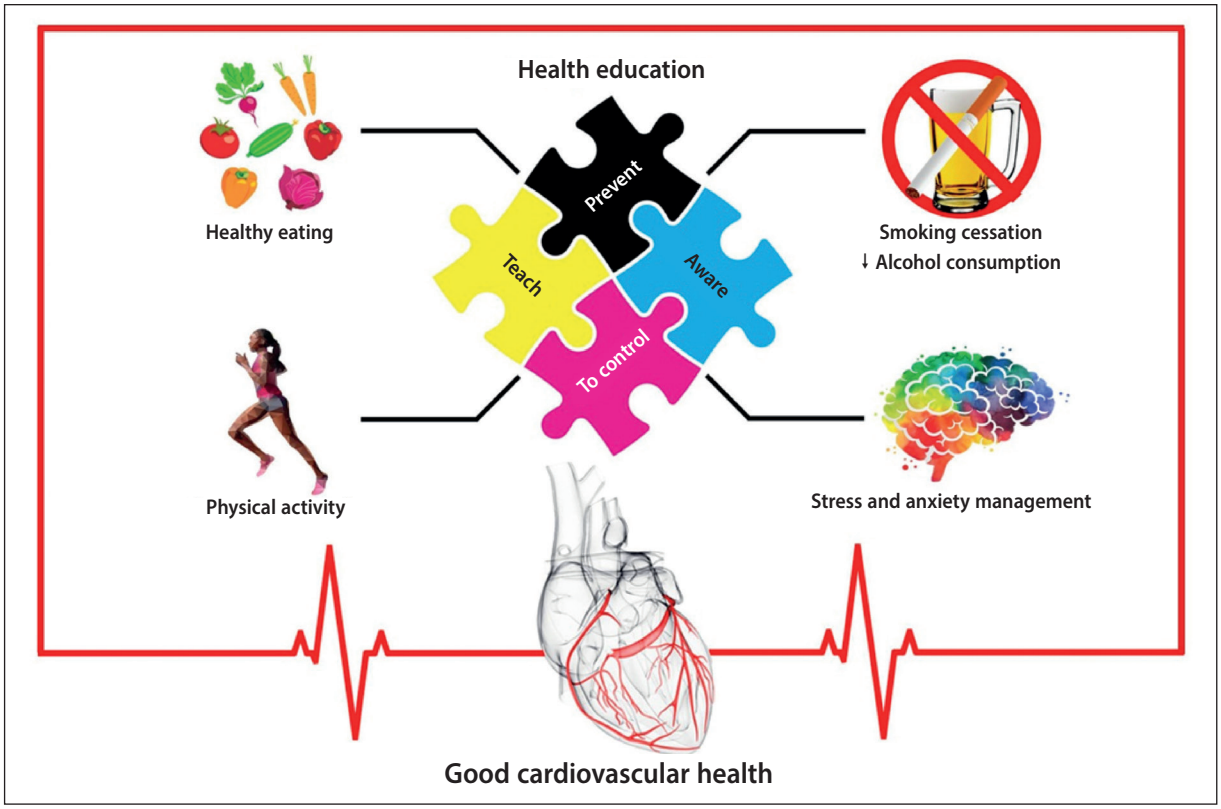


Figure 1. Essentially primary preventive approaches with a major impact on cardiovascular health.

of sedentary behavior on the clinical outcomes in 1,331,468 participants, considering the risk of cardiovascular mortality, cancer mortality, and all-cause mortality, and the incidence of type 2 diabetes. By analyzing the selected studies, the authors found a significantly increased risk of cardiovascular mortality and all-cause mortality from sedentary behaviors, which were described by watching TV more than 3-4 hours daily and sitting 6-8 hours. Thus, they concluded that such behaviors, regardless of the level of physical activity, are associated with a higher risk for outcomes caused by chronic diseases.[5]

A recent study promoted by the World Health Organization (WHO) and published in The Lancet showed alarming results regarding the scenario of physical inactivity in Brazil. According to the survey conducted over 15 years, almost half of the Brazilian population in adult age (47%) was considered physically inactive, that is, they did not meet the current minimum physical activity recommendations.[6] In this sense, it is worth mentioning that the WHO recommends 150 minutes per week of moderate exercise or 75 minutes of intense exercise for the adult population in general.[7] However, recommendations may vary for physical exercise aimed at the treatment of diseases or other specific purposes.[8,9] The results obtained in this study place Brazil among the most sedentary countries in the world, ahead of the United States (with a sedentarism rate of approximately 40%), making it the most sedentary country in Latin America. In view of this, public policies to encourage physical activity must be promoted and expanded. It is important that health managers carefully evaluate proposals aimed at raising awareness among the population regarding the importance of practicing physical activities and its benefits for an individual's overall health. The WHO, in turn, has released a global action plan with targets for 2030.[10] Among them is a 15% reduction of sedentarism in adolescents and adults by 2030. In order to achieve these proposed goals, the focus will be on creating more active societies, environments, people, and systems.[10] It is believed that promoting a more physically active life through exercises will lead to the accomplishment of other goals directly associated with health, thus benefiting the population even more.

In this context, it is important to emphasize that sedentary behavior may result from the interaction of different factors, including family, and environmental, educational and socioeconomic factors. Technological advances in the development of increasingly comfortable routines and environments are threats to the maintenance of more active lifestyles. However, the positive side of this evolution is the possibility of creating new strategies for primary and secondary prevention of CVDs, such as the use of applications for prevention of CVDs and increased physical activity.[11-13] Although it is highly complex to implement changes aimed at reducing the incidence and mortality because of CVDs, the changes should be directed toward individuals and the population[14] The adoption of healthy habits during the first years of life and in adolescence has been increasingly sought. It is known that chronic exposure of an individual to an increasingly "obesogenic" environment strongly favors the development of increasing physical inactivity and more likelihood of developing CVDs. The benefits provided by physical activity in children and adolescents are significant and indisputable, including improvement in cardiorespiratory health parameters, cardiometabolic risk factors, and mental and skeletal health.[15-17] Moreover, studies have shown that conducting interventions with the promotion of regular walks within the school environment or even school trips seems to raise the levels of physical activity in children and adolescents, at least in the short term.[18] This would already represent a major step towards a healthier future considering the difficulties faced today. A systematic review with meta-analysis showed that physical activity and exercise programs for a minimum period of six months are effective in reducing blood pressure and triglycerides among school-age children (between six and 12 years of age) when compared to interventions with shorter periods,[19] demonstrating that regularity of practice is an important factor for improving cardiovascular health and reducing risk in this population.

In our environment, intervention programs in school environments have been developed in order to (re)educate children regarding cardiovascular risk factors and to promote health. One example is the *Coração de Estudante* (Student Heart) project, currently named "*SBC vai à escola*" (SBC goes to school), which is supported by universities and scientific societies, such as SOCESP; it aims to develop a program of action strategies encompassing students between six and 17 years of age and focus on simultaneous action on seven modifiable cardiovascular risk factors (hypertension, dyslipidemia, obesity, diabetes, smoking, sedentarism, and stress) and two protective factors (regular physical activity and healthy eating). The main objective of this program is to guide school children and adolescents on how to act preventively in relation to the modifiable risk factors for atherosclerosis, and to stimulate a healthy lifestyle with the presence of protective factors. The project brings the message to the children and youth population that each one who participates in the project becomes a multiplier, thus together contributing to the formation of a Brazil with future generations having healthy hearts. An important and fundamental aspect of this project is the interdisciplinary, interprofessional, and intersectoral character of the intervention, involving professionals from different municipal departments, including education, health, and sports. It also seeks to integrate the knowledge and technique of various disciplines, namely medicine (cardiology, pediatrics, and endocrinology), psychology, nutrition, and physical education. In 2012, this program was implemented in five CEUs (*Centro Educacional Unificado* – Unified Educational Center) in the city of São Paulo, after training 269 monitors. It reached 1500 children, with significant improvement in the knowledge of monitors and students being observed in the questionnaires on knowledge of cardiovascular risk and forms of prevention of CVDs which were administered after the action. It is important to note that parents are invited to participate in one of the days of this action and reports by students and parents suggest an important role of children and adolescents in their family environment as multipliers of knowledge and attitudes towards health promotion.[20] Another example was the Children First Study, a prospective and randomized study conducted in the year 2010 in a private school in Jundiaí, Sao Paulo, which evaluated 197 children (between six and 10 years of age) and their 323 parents. In this study, a group of parents received written information about cardiovascular health during the year (control group) and in the other group, in addition to the parents receiving

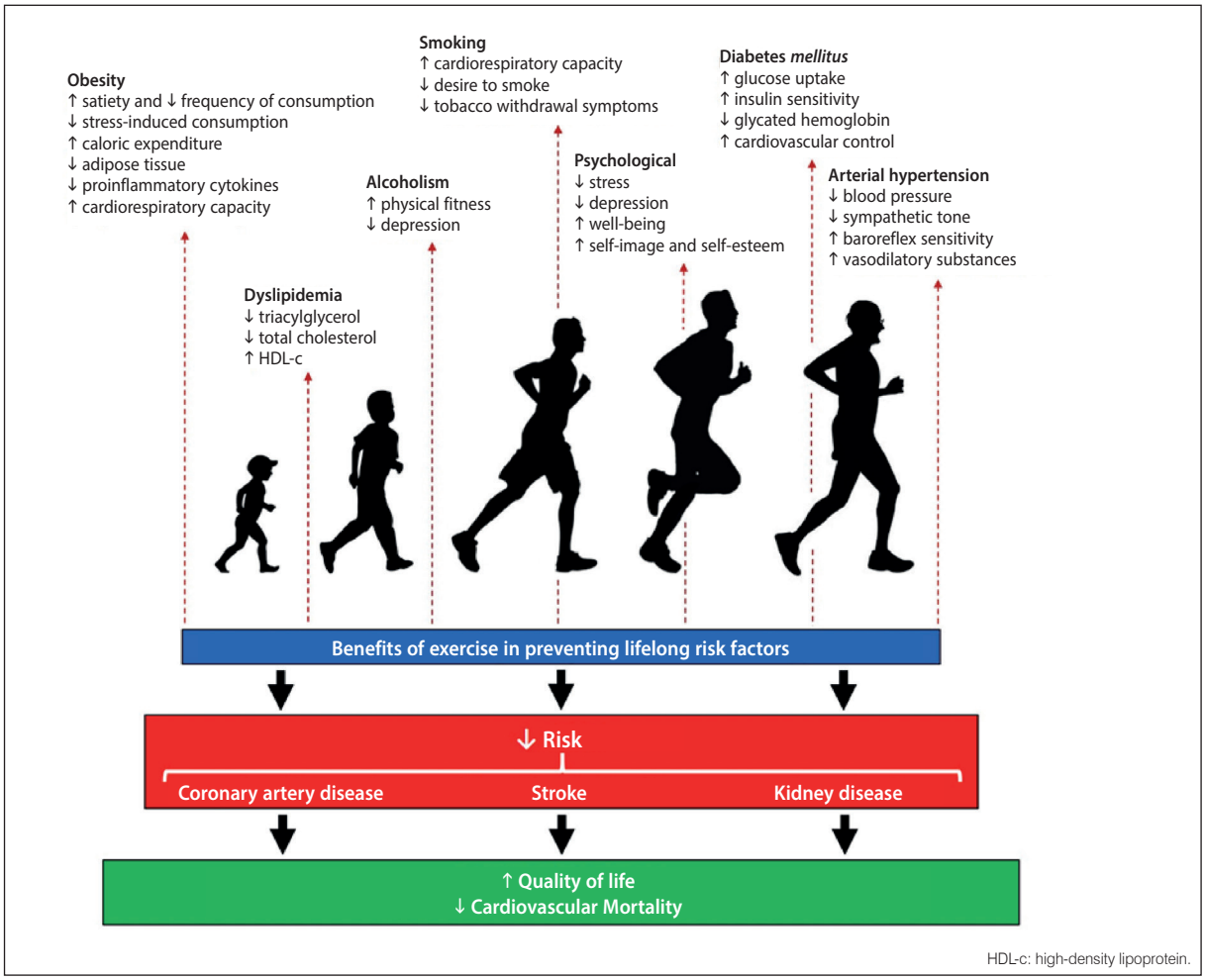
the information, the students participated in a weekly multidisciplinary educational program on cardiovascular health during the year, with one hour of duration (intervention group). The results showed a significantly higher reduction of cardiovascular risk in parents of the intervention group compared to those of the control group.[21] These studies/actions show that prevention of CVD should begin with a transformation of habits and behaviors in childhood, with the help of parents, teachers, and multidisciplinary health staff. Furthermore, students involved in these interventions tend to be multipliers of health promotion within families.

In fact, the main medical guidelines for the prevention and treatment of chronic diseases have classified physical activity as an essential component of the therapeutic approaches adopted for these conditions.[22] Evidence has shown that activities, such as walking, are inversely related to the risk of CVDs and all-cause mortality regardless of gender, thus providing an efficient alternative in primary prevention programs.[23] Moreover, this relationship seems to be even more significant when a moderate pace is prioritized rather than walking at a high pace.[23] The benefits of walking were also observed by Carter et al. who found that short, two-minute walking intervals for people who spend hours sitting may contribute to the maintenance of cerebral blood flow. These benefits thus have a great clinical impact on long-term cerebrovascular health,[24] as well as on the risk of stroke, considering that the modifiable vascular risk factors for this condition are the same for diseases that cause cognitive impairment, dementia, and Alzheimer's disease.[25]

THE ROLE OF EXERCISE IN THE PREVENTION AND TREATMENT OF CARDIOVASCULAR RISK FACTORS

Exercise includes any systematized physical activity which is properly designed and prescribed considering the training variables aimed at specific objectives. Physical activity, in turn, is any motor gesture that results in energy expenditure above resting conditions.

As illustrated in Figure 2, several evidences reported in the literature confirm the immediate and long-term benefits on the risk factors for CVDs promoted by exercise when they are evaluated individually.[9] In this sense, the efficiency of aerobic physical training in reducing pressure levels in hypertensive patients has been well established. In this condition, exercise can act on neural and humoral mechanisms to control blood pressure[26] by reducing sympathetic tonus and vasoconstrictor factors in the circulation, increasing vagal influence, improving the baroreceptor sensitivity, and providing greater bioavailability of vasodilators, such as nitric oxide.[7,28] With regard to



HDL-c: high-density lipoprotein.

Figure 2. Benefits of regular exercise in primary and secondary prevention of individual risk factors.

the type of exercise, in a meta-analysis conducted with 5223 normotensive, prehypertensive and hypertensive participants, Cornelissen & Smart found that aerobic physical training is effective in reducing blood pressure in both prehypertensive and hypertensive individuals. However, the benefits of resistance training in reducing blood pressure were significant only in prehypertensive individuals, suggesting that both types of exercise are effective in preventing hypertension.[29]

A important aspect to be considered in the development of CVDs is heredity, a risk factor classified as non-modifiable. Our research group evaluated young adults with hypertension and found increased cardiac sympathetic modulation at rest and increased blood pressure and heart rate responses after an isometric test of maximum effort involving large muscle groups, when compared to normotensive children. These findings demonstrate early cardiac autonomic dysfunction in children of hypertensive patients, even before clinical changes in blood pressure values occur.[30] Furthermore, we showed in a recent study that the autonomic changes observed in children of sedentary hypertensive parents were not observed in the children of hypertensive individuals who performed resistance training regularly.[31] Such findings suggest that having a physically active life plays an important role in modulating early changes related to heredity, which is a non-modifiable risk factor. In this sense, from a preventive perspective, populations genetically predisposed to CVDs should be the target of increasingly early interventions in order to prevent/retard the appearance of dysfunctions associated with the development of CVDs.

Moreover, the regular practice of exercises is essential for maintaining the quality of life and well-being of diabetics. Several guidelines provide relevant information not only to ensure a professional and safe performance of the work, but also to emphasize the role of exercise in improving the health of this population. The main benefits observed after exercise in this disease are improved glycemic control and reduced cardiovascular risk, which are the result of molecular adaptations that favor cellular glucose uptake, as well as improved cardiovascular regulation mechanisms. Exercise can increase insulin sensitivity and promote insulin-independent glucose uptake, favoring the reduction of glucose levels in type 2 diabetic patients.[32] Moreover, when associated aerobic and resistance training, an even greater improvement in insulin sensitivity and reduction in glycated hemoglobin is observed when compared to both exercise alone.[33] In addition to the metabolic benefits observed, physical training has proven effective in promoting improvement in cardiac autonomic modulation in different populations.[34] Studies using experimental models of diabetes have shown a significant improvement in autonomic control of circulation in response to physical training,[35] a mechanism that is highly compromised in type 1 or type 2 diabetes and is strongly associated with cardiovascular mortality in this population.[36,37]

The association between obesity and the development of type 2 diabetes and CVDs has been increasingly established. Currently, it is known that the development of insulin resistance is associated with a subclinical inflammatory condition commonly observed in obese and diabetic patients which ends up favoring impaired cell signaling. Conversely, studies investigating anti-inflammatory response have observed an improvement in the systemic inflammatory condition after physical training, even in the absence of weight loss.[38] In a recent study using a type 2 diabetes model characterized by cardiac and autonomic dysfunction associated with inflammation and oxidative stress,[39] we found that resistance, aerobic, or combined physical training initiated early in obese mice (ob/ob) can prevent/attenuate metabolic, cardiovascular, and autonomic dysfunctions.

Furthermore, the association between the practice of regular exercise and adequate diet has been recommended as an effective strategy in the prevention and treatment of metabolic syndrome. Conversely, high sugar intake has contributed to increased mortality because of obesity, diabetes, and CVDs, which affects individuals of all ages. In this sense, our group has recently investigated the cardiometabolic changes in a model of metabolic syndrome induced by fructose overload (a sugar, known as corn syrup, that is widely used in the food industry), as well as the role of physical training in this condition. From the point of view of the onset of these changes, it showed that cardiovascular autonomic dysfunction, characterized by baroreceptor sensitivity, already occurred in seven days of fructose overload in genetically hypertensive animals. This was followed by increased levels of pro-inflammatory cytokines, which are markers of cell injury, and the reduction of vasodilators and antioxidants after 15 days of protocol, resulting in metabolic and cardiovascular changes after 30 days of fructose consumption.[40] Moderate intensity aerobic physical training initiated simultaneously with fructose overload, in turn, prevented the above mentioned dysfunctions.[41] These findings together suggest that autonomic dysfunction is in the genesis of the development of metabolic changes and physical training could minimize that physical training could minimize the possibility of developing metabolic syndrome in adulthood, thereby directly influencing cardiovascular risk.

Regular exercise has also proved effective in reducing and increasing triacylglycerol and high-density lipoprotein (HDL-c) fractions, respectively.[42] Moreover, the HDL-c fraction undergoes qualitative changes (i.e., physical training has the potential to change the composition of this lipoprotein to a less atherogenic profile by increasing the HDL-2 [42] fraction), thus favoring lower cardiovascular risk.

It is worth noting that there is a highly complex and singular relationship between exercise and alcohol consumption. As found in a meta-analysis, the evidence so far suggests that regular exercise does reduce alcohol consumption. Conversely, exercise has been an efficient alternative strategy for improving physical fitness and disorders caused by alcoholism, such as depression.[43]

It is important to highlight that the effects of exercise on smoking are still controversial. Smoking is directly associated with an increase in mortality and is considered as the main relative risk factor. A meta-analysis showed that acute exercise sessions can reduce tobacco craving as well as tobacco withdrawal symptoms such as irritability, tension, depression, concentration dichotomies, stress, and restlessness.[44] It has also been observed that the manipulation of the intensity of exercise seems to influence the duration and extent of the desire for tobacco, making it possible to obtain greater

effects of smoking cessation with high-intensity exercise. Thus, although smoking reduction may be indirectly affected by exercise, further investigations are needed, even under different conditions, before recommending exercise as a specific tool for smoking cessation.[45]

PSYCHOLOGICAL DIMENSIONS AND PREVENTION OF CVDS

The relationship between psychological dimensions and CVDs has been a subject of interest for psychocardiology and has been studied for many decades. In a review on the subject, Trigo et al. described the different moments and theoretical waves of studies aiming at understanding the patterns of behavior that favor the emergence of CVDs.[46] The results produced contradictory but significant data for the area.

Studying personality characteristics in CVDs was Friedman & Rosenman's main goal for decades. They defined type A as that in which hostility and irritability is strongly related to CVDs.[47] Their subsequent studies focused mainly on depression. Trigo et al. focused on the improvement of studies, and over the years, the inclusion of components such as hostility and anger contributed to the formation of type D, which comprises the "negative affectivity" and "social inhibition" dimensions and is often associated with depression and social inhibition.[48]

Currently, the distress-related personality pattern (Type D) leads to studies of stressful phenomena which cause hemodynamic, neuroendocrine, and/or immunological changes, thus inducing, cardiovascular reactivity and accelerating the onset of CVDs. Stress manifests in cognitive, emotional, behavioral, social, and psychophysiological processes and is associated with the notion of urgency of time, and impatience.[46]

Soares et al. suggest that the presence of CVDs can produce a feeling of insecurity, anxiety, and fear according to the importance given to the heart (a fundamental organ in the functional system).[49] This situation can lead to poorly functional behaviors such as smoking, excessive eating, among others, which motivates the search for psychological strategies to prevent CVDs.

Johnston was one of the first researchers to study and describe two stages of CVDs prevention.[50] The primary stage aims at providing knowledge about CVDs, encouraging attitude change to potentiate behavioral change, and reducing the risk of being affected by CVDs. The secondary stage aims at presenting and teaching behavioral strategies to promote habit changes (i.e., using less sodium in food and exercising, among others).

The WHO encourages actions for lifestyle change and points out that low adherence should be addressed by prevention programs. Soares et al. point out that intervention strategies in the initial phase of treatment aim at helping individuals to welcome feelings of fear, depression, and anxiety as a result of contact with information on CVDs.[49] Raising public awareness of what CVDs are, and the potential need for changing habits, will strengthen the adoption of new individual, family, and group behavioral standards.

Orientation guides published in Brazil and worldwide suggest actions that promote information, action of care, and the experience of new habits. Here, we highlight the Italian guide[51] that establishes a step-by-step relationship between patients and psychologists, encompassing the following phases:

1. Selection: patients have the right to request psychological follow-up.
2. Contact: information on CVDs.
3. Follow-up: the resources available to diagnose psychological needs, and to provide a follow up schedule. It is important to understand everyday behaviors and habits.
4. Intervention: consultations that discuss and provide alternatives for rehabilitation of the patient and his or her family and social group (process organized based on Cognitive Behavioral Therapy).
5. Distance support: evaluation of changes and quality of life.

The prevention proposal, based on the existence of risk factors, considers the diversity of the public to be addressed, and its main purpose is to hear the life stories associated with CVDs because they show cultural perspectives related to daily habits, the way of life and thinking in the world, and their respective psychophysical and emotional consequences.

The literature indicates individual intervention strategies for the prevention of risk factors for CVDs originating from the Cognitive Behavioral Therapy theoretical approach.[52-54]

Chauvet-Gelinie & Bonin state that psychological factors related to CVD are directly associated with perceived stress, coping styles, personality traits, and forms of social support, which influence the development or not of CVD.[52] Coping is defined by the authors as all cognitive and behavioral efforts made to manage internal or external stimuli which potentially exceed personal resources, and the use of one confrontation strategy or another is determined by the stressful event (type, severity, duration, etc.) and the person's profile (cognition, personality, personal history, etc.). The authors emphasize that we may have strategies focused on problems (which seem to be specific to CVDs when talking about changing, for example, the habit of smoking, excessive eating, etc.) and strategies focused on emotions (which arise when, in prevention, the individual experiences fear or anxiety from having to do something proposed in the follow-up).

Magomedova & Damadaeva report that psychological interventions can be performed in a group or individually and can be complemented with strategies to raise awareness about CVDs, manage stressful situations, and help in dealing with adaptations to lifestyle changes.[53]

In Brazil, Lipp is a reference in the study and applicability of strategies for the prevention and treatment of CVD-related stress.[55-59] As a result of his studies conducted over decades, the author proposed Stress Control Training (SCT) described as a method where the motivation to change is the active principle, and internal sources of stress such as personality, values, and personal beliefs strengthen aspects of questioning and adaptation to ways of managing and setting goals in the short, medium, and long term, aiming at quality of life and longevity.

Recently, new intervention strategies such as biofeedback, have gained ground in the prevention of CVDs.[60] Biofeedback is a physical consciousness management technique mediated by equipment which monitors body functions and helps manage involuntary physiological responses. Making subtle changes, for example in our breathing rate, and recognizing heart rate and breathing patterns, favors facing anger and its physical consequences. Another approach that has been

studied is self-awareness and mindfulness, in which mindfulness training favors contact with psychophysical consciousness and emotional processes which hinder self-knowledge, thus favoring and encouraging decision making and choices for new patterns of relationship with oneself and with the world.

RECOMMENDATIONS FOR NON-PHARMACOLOGICAL INTERVENTION OF CARDIOVASCULAR RISK

Based on the recommendations of the I Cardiovascular Prevention Guideline[62] and recent international recommendations,[63] we suggest the following actions for individual intervention from the perspective of physical education and psychology for the prevention of CVDs:

Interdisciplinary care (a team of professionals from different areas carrying out the prevention program).

A relationship of trust between health professionals and patients.

An incentive to practice exercises three to five days a week, but preferably every day, for children, adults, and the elderly.

The recommendation that children and young people between 5 and 17 years of age practice at least 60 minutes of moderate to vigorous physical activity daily (300 min/week).

The recommendation to practice 30 minutes per day (five days/week) of moderate intensity exercises (total of 150 minutes/week) or 15 minutes per day (five days/week) of vigorous intensity exercises (total of 75 minutes/week) for adults.

The suggestion of short-term exercise sessions (up to 10 minutes) may be an appropriate strategy for physically deconditioned individuals.

When more individualized care is possible, performing an initial assessment composed of anamnesis, and physical and clinical examination, which can be complemented with more in-depth assessments such as a cardiopulmonary test, anthropometric measurements, muscle strength, and flexibility in cases where cardiovascular risk factor are present". subir essa frase para antes de "such as a cardiopulmonary test. Prescribing the intensity, duration, and frequency of exercise according to the individual profile, considering the use of medications so that the practice of exercises is effective and safe. If risk factors are present or CVDs are already established, seeking specific recommendations for exercise prescription in order to avoid risks and obtain the greatest benefit possible. Controlling exercise intensities using reliable variables, such as maximum oxygen consumption (VO_2max) and ventilatory thresholds, rating of perceived exertion (RPE), speech test, and percentage of estimated or measured maximum heart rate.

Interviews to know the patient's life history (cultural, psychophysical, and social aspects).

Organizing the schedule of care including psychoeducational and clinical intervention sessions.

Psychoeducational sessions are aimed at clarifying CVDs and should be conducted in order to explore the various forms of communication (linguistic, visual, and experiential, among others).

Psychological intervention sessions should be scheduled (from six to eight sessions on average) with a focus on solving problems and balancing emotions. We suggest defining what the problems are, defining alternatives with the patient, encouraging decision making, and implementing and checking solutions. It is important to manage the intensity of emotions and experiences improving the levels of tension, raising awareness about breathing, promoting relaxation, and evaluating gains and losses in quality of life.

Psychological monitoring at a distance, which can be done in different periods, such as 30 days after the in-person intervention, and 60 and 90 days to establish adoption strategies (behavioral change), with subsequent ending of the intervention.

CONCLUSIONS AND PROSPECTS

Public health is challenged by the obesity epidemic, the significant mortality from CVDs, and the complications associated with these conditions, which require the implementation of preventive measures. Having knowledge of the current situation of the prevalence of physical inactivity and psychological stress, as well as the association of these factors with the development of CVDs, which generates high costs for health systems, is fundamental for investing more, especially in primary prevention, in order to ensure access to minimum conditions for health promotion. Even in the face of all the evidence showing the countless benefits promoted by exercise and its role as a cardiovascular protector, the population is increasingly inactive and susceptible to the risk of morbidity and mortality. In this sense, directing efforts to combat sedentary lifestyle, bad eating habits, smoking, alcohol consumption, and stress, especially in children and adolescents in the school environment, seem to be cost-effective measures in the medium and long term. Thus, proposing and implementing actions considering the psychological and behavioral aspects of individuals will play a relevant role in health promotion, thus extending the approach and health management of the population.

CONFLICTS OF INTEREST

The author declares that he has no conflicts of interest in this work.

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of the manuscript. KDA performed the literature review, writing, and critical review of all content. MJF prepared the figures and performed the literature review, writing, and critical review of the content. LFA performed the literature review, writing, and critical review of all content.

REFERENCES

1. **Bansilal S, Castellano JM, Fuster V. Global burden of CVD: focus on secondary prevention of cardiovascular disease. Int J Cardiol. 2015;201(Suppl.1):S1–7.**
2. Oldridge NB. Economic burden of physical inactivity: healthcare costs associated with cardiovascular disease. Eur J Cardiovasc Prev Rehabil. 2008;15(2):130–9.

3. Tremmel M, Gerdtham UG, Nilsson PM, Saha S. Economic burden of obesity: a systematic literature review. Int J Environ Res Public Health. 2017;14(4):E435
4. Morris JN, Heady JA, Raffle PA, Roberts CG, Parks JW. Coronary heart-disease and physical activity of work. Lancet. 1953;265(6796):1111–20.
5. Patterson R, Mcnamara E, Tainio M, de Sá TH, Smith AD, Sharp SJ, et al. Sedentary behaviour and risk of all-cause, cardiovascular and cancer mortality, and incident type 2 diabetes: a systematic review and dose response meta-analysis. Eur J Epidemiol. 2018;33(9):811–29.
6. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1,9 million participants. Lancet Glob Health. 2018;6(10):e1077 -e1086.
7. WHO. Global recommendations on physical activity for health: 18-64 years old. Geneva; 2011.
8. Raso V, Greve JMD, Polito MD. Pollock - Fisiologia Clínica do Exercício. São Paulo: Manole; 2011.
9. Pedersen BK, Saltin B. Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports. 2015;25 (Suppl.3):1–72.
10. WHO. Global action plan on physical activity 2018-2030: more active people for a healthier world. Geneva; 2018.
11. Widmer RJ, Collins NM, Collins CS, West CP, Lerman LO, Lerman A. Digital health interventions for the prevention of cardiovascular disease: a systematic review and meta-analysis. Mayo Clin Proc. 2015;90(4):469–80.
12. Bonn SE, Alexandrou C, Hjörleifsdottir Steiner K, Wiklander K, Östenson C, Löf M, et al. App-technology to increase physical activity among patients with diabetes type 2 - the DiaCert-study , a randomized controlled trial. BMC Public Health. 2018;18(1):119..
13. Feldman DI, Theodore Robison W, Pacor JM, Caddell LC, Feldman EB, Deitz RL, et al. Harnessing mHealth technologies to increase physical activity and prevent cardiovascular disease. Clin Cardiol. 2018;41(7):985–91.
14. Balakumar P, Maung-u K, Jagadeesh G. Prevalence and prevention of cardiovascular disease and diabetes mellitus. Pharmacol Res. 2016;113:600–9.
15. Andersen LB, Riddoch C, Kriemler S, Hills A. Physical activity and cardiovascular risk factors in children. Br J Sports Med. 2011;45(11):871–6.
16. Ekelund U, Luan J, Sherar LB, Esliger DW, Griew P, Cooper A. et al. Moderate to vigorous physical activity and sedentary time and cardiometabolic risk factors in children and adolescents. JAMA. 2012;307(7):704–12.
17. Hallal PC, Victora CG, Azevedo MR, Wells JC. Adolescent physical activity and health: a systematic review. Sport Med. 2006;36(12):1019–30.
18. Carlin A, Murphy MH, Gallagher AM. Do interventions to increase walking work? A systematic review of interventions in children and adolescents. Sport Med. 2016;46(4):515–30.
19. Cesa CC, Sbruzzi G, Ribeiro RA, Barbiero SM, de Oliveira Petkowicz R, Eibel B, et al. Physical activity and cardiovascular risk factors in children: meta-analysis of randomized clinical trials. Prev Med. 2014;69:54–62.
20. Lantieri CJB, De Angelis K, Alonso D de O, Jatene IB. Projeto coração de estudante: uma ação para redução do risco cardiovascular e promoção da saúde. Rev Soc Cardiol do Estado São Paulo. 2013;23(2):55–63.
21. Fornari LS, Giuliano I, Azevedo F, Pastana A, Vieira C, Caramelli B. Children First Study: how an educational program in cardiovascular prevention at school can improve parents' cardiovascular risk. Eur J Preven Cardiol. 2013;20(2):301–9.
22. Sociedade Brasileira de Cardiologia. 7ª Diretriz Brasileira de Hipertensão Arterial. Arq Bras Cardiol. 2016;107:1–83.
23. Hamer M, Chida Y. Walking and primary prevention: a meta-analysis of prospective cohort studies. Br J Sports Med. 2008;42(4):238–43.
24. Carter SE, Draijer R, Holder SM, Brown L, Thijssen DHJ, Hopkins ND. Regular walking breaks prevent the decline in cerebral blood flow associated with prolonged sitting. J Appl Physiol (1985). 2018;125(3):790–8.
25. Gardener H, Wright CB, Rundek T, Sacco RL. Brain health and shared risk factors for dementia and stroke. Nat Rev Neurol. 2015;11(11):651–7.
26. Fagard RH. Exercise is good for your blood pressure: effects of endurance training and resistance training. Clin Exp Pharmacol Physiol. 2006;33(9):853–6.
27. De Angelis K, Wichi RB, Jesus WR, Moreira ED, Morris M, Krieger EM, et al. Exercise training changes autonomic cardiovascular balance in mice. J Appl Physiol (1985). 2004;96(6):2174–8.
28. Zanesco A, Antunes E. Effects of exercise training on the cardiovascular system: pharmacological approaches. Pharmacol Ther. 2007;114(3):307–17.
29. Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. J Am Heart Assoc. 2013;2(1):e004473.
30. Francica JV, Heeren MV, Tubaldini M, Sartori M, Mostarda C, Araujo RC, et al. Impairment on cardiovascular and autonomic adjustments to maximal isometric exercise tests in offspring of hypertensive parents. Eur J Prev Cardiol. 2012;20(3):480–5.
31. Santa-Rosa FA, Shimojo GL, Sartori M, Rocha AC, Francica JV, Paiva J, et al. Familial history of hypertension-induced impairment on heart rate variability was not observed in strength-trained subjects. Braz J Med Biol Res. 2018;51(12):e7310.
32. Way KL, Hackett DA, Baker MK, Johnson NA. The effect of regular exercise on insulin sensitivity in type 2 diabetes mellitus: a systematic review and meta-analysis. Diabetes Metab J. 2016;40(4):253–71.
33. Johannsen NM, Swift DL, Lavie CJ, Earnest CP, Blair SN, Church TS. Combined aerobic and resistance training effects on glucose homeostasis, fitness, and other major health indices: a review of current guidelines. Sport Med. 2016;46(12):1809–18.
34. Ferreira MJ, Zanesco A. Heart rate variability as important approach for assessment autonomic modulation. Motriz: Rev Educ Fis. 2016;22(2):3–8.
35. De Angelis K, Oliveira AR, Dall'Ago P, Peixoto LRA, Gadonski G, Lacchini S, et al. Effects of exercise training on autonomic and myocardial dysfunction in streptozotocin-diabetic rats. Braz J Med Biol Res. 2000;33(6):635–41.
36. De Angelis K, Irigoyen MC, Morris M. Diabetes and cardiovascular autonomic dysfunction: application of animal models. Auton Neurosci. 2009;145(1–2):3–10.
37. Anaruma CP, Ferreira M Jr, Sponton CH, Delbin MA, Zanesco A. Heart rate variability and plasma biomarkers in patients with type 1 diabetes mellitus: effect of a bout of aerobic exercise. Diabetes Res Clin Pract. 2015;111:19–27.
38. Karstoft K, Pedersen BK. Exercise and type 2 diabetes: focus on metabolism and inflammation. Immunol Cell Biol. 2015;94(2):146–50.
39. Sartori M, Conti FF, Dias DDS, Dos Santos F, Machi JF, Palomino Z, et al. Association between diastolic dysfunction with inflammation and oxidative stress in females ob/ob mice. Front Physiol. 2017;8:572.
40. Bernardes N, da Silva Dias D, Stoyell-Conti FF, de Oliveira Brito-Monzani J, Malfitano C, Caldini EG, et al. Baroreflex impairment precedes cardiometabolic dysfunction in an experimental model of metabolic syndrome : role of inflammation and oxidative stress. Sci Rep. 2018;8(1):8578.
41. Farah D, Nunes J, Sartori M, Dias DD , Sirvente R, Silva MB, et al. Exercise training prevents cardiovascular derangements induced by fructose overload in developing rats. PLoS One. 2016;11(12):e0167291.

42. Wood PD, Stefanick ML, Willians PT, Haskell WL. The effects on plasma lipoproteins of a prudent weight-reducing diet, with or without exercise, in overweight men and women. N Engl J Med. 1991;325(7):461–6.

43. Hallgren M, Vancampfort D, Giesen ES, Lundin A, Stubbs B. Exercise as treatment for alcohol use disorders: systematic review and meta-analysis. Br J Sports Med. 2017;51(14):1058–64.

44. Roberts V, Maddison R, Simpson C, Bullen C, Prapavessis H. The acute effects of exercise on cigarette cravings, withdrawal symptoms, affect, and smoking behaviour: systematic review update and meta-analysis. Psychopharmacology(Berl). 2012;222(1):1–15.

45. Ussher MH, Taylor AH, Faulkner GE. Exercise interventions for smoking cessation. Cochrane Libr Cochrane Database Syst Rev. 2014;(8):CD002295.

46. Trigo M, Silva DR, Rocha EC. Factores psicossociais de risco na doença coronária: para além do comportamento tipo A. Rev Port Cardiol. 2005;24(2):261–81.

47. Friedman M, Rosenman RH. Overt behavior pattern in coronary heart disease. Detection of overt behavior patterns A in patients with coronary disease by a new psychophysiological procedure. JAMA. 1960;173:1320–25.

48. Denollet J. Biobehavioral research on coronary heart disease: where is the person? J Behav Med. 1993;16(2):115–41.

49. Soares MRZ, Ferreira RR, Carvalho FA, Santos DR. Psicocardiologia: análise de aspectos relacionados à prevenção e ao tratamento de doenças cardiovasculares. Rev Bras de Ter Comp Cogn. 2016;18(1):59–71.

50. Johnston DW. Prevention of cardiovascular disease by psychological methods. Br J Psychiatry. 1989; 154:183–94.

51. Sommaruga M, Tramarin R, Angelino E, Bettinardi O, Cauteruccio MA, Miglioretti M, et al. Guidelines on psychological intervention in cardiac rehabilitation- methodological process. Monaldi Arch Chest Dis. 2003;60(1):40–4.

52. Chauvet-Gelinier JC, Bonin B. Stress, anxiety and depression in heart disease patients: a major challenge for cardiac rehabilitation. Ann Phys Rehabil Med. 2017;60(1):6–12.

53. Magomedova SA, Damadaeva AS. Medico-social and psychological aspects of cardiovascular diseases. Biol Med (Aligarh). 2016;8:1-4.

54. Bennett SJ, Cordes DK, Westmoreland G, Castro R, Donnelly E. Self-care strategies for symptoms management in patients with chronic heart failure. Nurs Res. 2000;49(3):139–145.

55. Lipp MEN, Barbieri FE, Santana L, Justo AP, Cabral AC, Santos FU dos, et al. Perception of risk from electric and magnetic fields: stress effects and psychological aspects. Estud Psicol (Campinas). 2013;30(4):497–506.

56. Lipp MEN, Guimaraes CA. Quando pequenas mudanças fazem grande diferença: um estudo de caso. Perspectivas em Psicologia. 2011;15:281-290.

57. Lipp MEN, Pinho C, Catelli AC, Santos MG, Fujita AT. O controle da raiva: eficácia do treino cognitivo na doença arterial coronariana. Estudos de Psicologia (Campinas). 2009;26(4):505-513.

58. Lipp MEN. Controle do estresse e hipertensão arterial sistêmica. Rev Bras Hipertens. 2007;14(2):89–93.

59. Lipp MEN, Justo AP, Matos TMG de. Cardiovascular reactivity: differential effect of expressing and inhibiting emotions during moments of interpersonal stress. Rev Soc Cardiol do Estado de São Paulo. 2006;9(2):154–61.

60. Hillman H, Chapman CJ. Biofeedback and anger management: A literature review. NeuroRegulation. 2018;5(1):43–9.

61. Germer CK, Neff KD. Self-compassion in clinical practice. J Clin Psychol. 2013;69(8):856-67.

62. Simão A, Precoma D, Andrade JP, Correa FH, Saraiva JF, Oliveira GM, et al. I Diretriz Brasileira de Prevenção Cardiovascular. Arq Bras Cardiol. 2013;101(6 Suppl. 2):1–63.

63. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology. Eur Heart J. 2016;37(29):2315–81.