30 - THE ANTI-INFLAMMATORY EFFECT'S PHYSICAL EXERCISE IN THE PREVENTION OF CHRONIC NONCOMMUNICABLE DISEASES

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INTRODUCTION

The Chronic Noncommunicable Diseases (NCDs) such as cancer, diabetes, obesity and cardiovascular diseases are the major cause of mortality and disability in the world accounting for 59% of deaths annually, this problem is due to the lifestyle adopted today, which include poor diet, lack of physical activity and smoking, coming from the processes of globalization of the food industry, urbanization and industrialization (OPAS, 2003).

In this context exercise (EF) has an important role in preventing these diseases (EF understood from the concept of Santarém (S / D), being a structured physical activity to achieve some objective functional or morphological), it promotes various adaptations in the body, these adaptations may be listed as the change in body composition (muscle mass, body fat percentage, etc..), regulation of physiological markers such as heart rate and blood pressure, influence metabolism (anabolism and catabolism) of various substances, among other (DRAGO and CARNEVALI JR, 2011).

Moreover, the EF influences the body's inflammatory response, enhancing the body's defenses against the mechanisms linked to the emergence of NCDs (PETERSEN and PEDERSEN 2006, JR, 2011; PAULI et al, 2009; PEDERSEN, 2009; CARNEVALI JR., LIMA and ZANUTO, 2011; WALSH et al, 2011).

Thus, this work is relevant primarily because the subject is relatively new in health professionals in Brazil and many still do not know about the topic. Secondly, the explanation for the population over another benefit provided by EF in the pursuit of quality of life, noting the large number of deaths caused by physical inactivity. Finally this research will be important to academic level in order to contribute to future discussions and projects on the subject discussed here.

From the data presented it became necessary to include studies in this area of knowledge, considering that this is a relatively new area of interest exercise science.

Thus, this paper presents general objective is to analyze, through the literature review, the mechanisms of prophylactic exercise, in relation to the installation of NCDs. As the following specific objective: Aim kinds of effective exercises for an anti-inflammatory action, with respect to NCDs.

We performed a literature search, where we analyzed the major books and articles on health and physical activity, by searching the databases of the major sites in this area, such as PubMed and SciELO, and analyzing the journals related to the topic among which Brazilian Journal of Sports Medicine, Revista Brasileira Prescription for Exercise Physiology among others, using as search engine key words: Exercise, Inflammation and Chronic Diseases. Besides the virtual databases were also used personal collection of books.

The research was based on articles published from 1999 to 2011, in view of the great progress of works on the subject in the meantime, and in order to present a survey of current character.

1 - CHRONIC NONCOMMUNICABLE DISEASES (NCDs)

The NCDs are characterized by having an uncertain etiology, multiple risk factors, long latency periods, prolonged course, non-infectious origin and to be associated with functional disabilities (BRASIL, 2005).

These types of diseases include cardiovascular diseases, diabetes, obesity, cancer and respiratory diseases, are prevalent in developed countries, with the biggest factors cause stress and a sedentary lifestyle (MACHADO, 2006 apud OLIVEIRA, S / D).

These diseases still represent the major cause of mortality worldwide, 59% of all deaths per year (OPAS, 2003), surpassing diseases caused by infectious agents, such as AIDS.

Junior (2006) points as intermediary mechanism of the installation of NCDs, chronic subclinical inflammation (ICS), which is defined as "inflammation hidden, camouflaged, difficult to diagnose with the tools we have at present." The author considers the ICS the Bubonic Plague of the century, making an analogy to acute infectious disease that killed thousands of people in the fourteenth century, and also analyzes the state of chronic inflammation is associated with increased pro-inflammatory substances in the body, as C-Reactive Protein (PCR), tumor necrosis factor-alpha (TNF-alpha) and IL-6.

IL-6 is a cytokine that has both pro-inflammatory characteristics, as anti-inflammatory, depending on the tissue from which it was produced (skeletal muscle or adipose tissue). When this interleukin is released by adipocytes is related to the process of hyperinsulinemia and metabolic syndrome by reducing the expression of insulin receptor substrate and glucose in liver and muscle (PAULI et al, 2009).

Another activity of IL-6 is the reduction of lipoprotein lipase which results in the increased migration of fatty acids to the liver, causing a rise of abdominal visceral fat, given that IL-6 increases the secretion of triglycerides in the liver and is related well with the table of visceral obesity and hypertriglyceridemia (WAJCHENBERG, 2000). Thus we must observe the possible vicious circle between increased visceral fat, IL-6 and reduced lipoprotein lipase which produces an increase in visceral fat.

Volp et al (2008) also emphasize that IL-6 produced by adipocytes, determines the production and elevated serum some substances including CRP, which according Junior (2006) is considered by many researchers as a marker of systemic inflammation, infection and cell injury.

TNF-alpha is related to necrosis of tumor cells, we therefore gets its name, is a cytokine with inflammatory characteristics as triggers a cascade action for the release of other inflammatory cytokines. This substance was also related to reduced peripheral insulin sensitivity, promoting an increase in hepatic glycogenesis and generating a reduction in glucose uptake by skeletal muscle and adipose tissue, causing a case of hyperinsulinemia.

The expression of TNF-alpha is elevated in obese individuals, promoting the increase in volume of adipocytes in the subcutaneous tissue and visceral tank (VOLP et al, 2008).

PCR is a protein synthesized in the liver and is regulated by cytokines, particularly IL-6, TNF-alpha and IL-1. Adipocytes also produce significant amounts of this substance, which explains the context of inflammation present in obese

people (VOLP et al, 2008).

Besides the presence of PCR in inflamed tissues can be found in the infarcted myocardium and in atherosclerotic plaques, and is also able to activate the complement system, which is closely linked to early atherosclerotic plaque formation (SANTOS et al, 2003) .

PCR is also used in monitoring the progression of inflammation or infection in immunosuppressed patients (JÚNIOR, 2006). These data support the fact that the high substances such as IL-6, produced by adipocytes, TNF-alpha and PCR, are linked to inflammation, so that such substances possess character autocrine, paracrine and endocrine will act as regulating release of other substances both in neighboring tissues in other organs such as distance, highlighting the ongoing inflammatory process.

Besides the ICS, other processes such as metabolic syndrome (MS) and insulin resistance are aggravating for installation of NCDs.

The state of MS is analyzed by Ciolac and Guimaraes (2004), as a state characterized by the group of cardiovascular risk factors such as hypertension, hyperinsulinemia, insulin resistance, glucose intolerance / type 2 diabetes, central obesity and dyslipidemia (LDL-cholesterol and high triglycerides and low HDL cholesterol).

These abnormalities can be diagnosed as follows: obesity, measured by BMI (Body Mass Index), insulin resistance, measured by the concentration of blood glucose and fasting insulin, and visceral obesity, measured waist circumference (VOLP et al , 2008).

Volp et al (2008) also state that the possible link between inflammation and SM is insulin resistance.

Insulin resistance is defined as "metabolic disorder manifested by reduced glucose utilization by skeletal muscle peripheral" (CARVALHO, COLACO and FORTES, 2006, p.305).

Defects in insulin action in target cells of the muscle, liver and adipose tissue, leading to increased inflammation and chronic low intensity, being a bilateral relationship in which the chronic inflammatory process also induces insulin resistance (VOLP et al, 2008).

Analyzing the information displayed can observe that numerous causative factors have DCNT interrelated, such that the presence of one of the aforementioned factors is the presence of proinflammatory substances or insulin resistance, metabolic condition will provide a favorable appearance of other abnormalities, creating a vicious circle and rolling, which result in the emergence of NCDs.

2 - EXERCISE AND INFLAMMATION

The acute inflammatory response and is located a mechanism modulating the immune response during the EF (COSTA ROSA and VAISBERG, 2002), since this response includes the migration of leukocytes into the inflamed area (FOSCHINI, PRESTES and CHARRO, 2007), until the release cytokines that act at a distance on other body organs.

At this time, it is important to examine the role of IL-6 in the inflammatory process, considering that this cytokine may trigger entirely different responses depending on the tissue in which it was produced. As already mentioned, when it is released by adipocytes interleukin starts, or enhances an inflammatory process already underway (VOLP et al, 2008).

However, JÚNIOR (2011) stated that IL-6 would be much more infamatório a marker, which itself a cause of inflammation in accordance Petersen and Pedersen (2006) emphasize that the skeletal muscle was recently discovered as an endocrine organ which produces and This releases interleukin, which was considered the first "miocina" or "miokina" defined by Prestes et al (2006) as a cytokine that is produced and released during contraction of muscle fibers and that exerts beneficial effects in various distance organs of our body.

Thus, when this cytokine produced by skeletal muscle is produced by a route independent of TNF-alpha, a stimulus promoting the production of inflammatory cytokines such as IL-1ra and IL-10 and inhibiting the production of TNF-alpha, which also operates in the production of CRP and causes insulin resistance (PETERSEN, 2005 apud JÚNIOR, 2011).

JÚNIOR (2011) points out that IL-6 also promotes the burning of fats by oxidation and stimulates lipolysis process and decreases the ICS, while Walsh et al (2011) reported that IL-6 causes an increase in the uptake of glucose. This increase is due to the fact that the skeletal muscle cells are the major targets of insulin to regulate blood glucose, accounting for at least 80% uptake of circulating glucose. This increase in glucose uptake occurs through the increased expression of glucose receptors in this cell type (GLUT-4) promoted by EF (RIBEIRO, LIMA and CARNEVALI JUNIOR, 2010).

Petersen and Pedersen (2006) reported that the increase in IL-6 during exercise is exponential, and this increase is related to factors such as the intensity, muscle mass recruited, duration and exercise endurance capacity.

Prestes et al (2006) analyze that previous studies have shown that concentric exercises like cycling induced a lower elevation of IL-6 when compared to exercises eccentric characteristics such as race and practice of resistance exercise (weightlifting), with emphasis in this phase of movement. This fact should be related to the higher incidence of microdamage in skeletal muscles produced by this type of contraction, which would lead to greater muscle repair action by neutrophils and macrophages, leading to increased release of cytokines (FOSCHINI, PRESTES and CHARRO, 2007).

In addition IL-6, Walsh et al (2011) highlighted other miocina IL-15, which is expressed in human skeletal muscle and is related to muscle growth. This interleukin also would be related to lipid metabolism, that is, it has been suggested that its action in muscle-fat ratio, in order that greater muscle mass associated with a lower percentage of fat, particularly visceral significantly reduces the risk of emergence of NCDs.

The mRNA levels of IL-15 are upregulated after strength training session suggesting that regular training can lead to accumulation of IL-15 within the muscle. An interesting point is that there was a decrease in visceral fat, but no decrease of subcutaneous fat while the expression of IL-15 was increased muscle of rats (WALSH et al, 2011).

3 - ANALYSIS OF DIFFERENT TYPES OF EF IN PREVENTION NCDs

Drago and Carnevali Júnior (2011) conducted a review of literature in which they compared the physiological adaptations promoted by training performed at different intensities in control of risk factors associated with MS, and in conclusion found that the practice of EF decreases the risk related to each MS component. They also observed that exercise training of low and moderate intensity promotes benefits in reducing obesity, blood pressure, insulin sensitivity and lipoprotein levels. While strength training (ST) high intensity increases and preserves lean mass, acts in weight loss and reduces visceral adipose tissue, decreases systolic and diastolic blood pressure, improves glycemic control in diabetic patients and improves the profile lipid.

It is worth remembering that the TF also promotes the same benefits cited for the low-intensity aerobic exercise, such as improving lipid and lipoprotein levels, improvements in insulin sensitivity, decreased resting heart rate, and still can improve aerobic power (SIMÃO , 2009).

According to the characteristics described above, the TF can and should be used as a main part of a training program

aimed at the prevention of DCNT, since it reduces the inflammatory status in two ways: increasing muscle mass and hence the production of character possessing anti miocinas -inflammatory, and decreasing the percentage of fat, especially visceral which is closely linked to processes such as ICS, Insulin Resistance and SM (WINETT and CARPINELLI, 2001).

In this perspective the low-intensity aerobic exercise, could be used in regenerative and rest periods between TF high intensity, and this association is able to produce positive change in relation to risk factors of MS (DRAGO and CARNEVALI JR, 2011).

But it is important to have a control on aerobic training, both in volume and intensity, because as Powers and Howley (2009), increases in the frequency, duration and intensity of aerobic exercise can cause risk of cardiovascular complications and orthopedic problems.

Aerobic exercise thus be charged with a frequency of 3 to 4 times per week, lasting from 20 minutes to 30 minutes a day at an intensity of 60% to 80% VO2max, so as not to reach the high levels of risk mentioned above (POWERS and HOWLEY, 2009).

FINAL

The EF as a specific category of physical activity, structured physical education professional and controlled in volume and intensity is configured as a primary factor in the prevention of NCDs and the proper functioning of the immune system, given the performance of this system together with the neuroendocrine in control of the main mechanisms of installing this type of disease, which were cited as the ICS, MS, insulin resistance and stress.

Thus, we found that EF more intense and of short duration are safer and more effective for the prevention of NCDs, can and should be used as the main part in a training program for health.

Aerobic exercise of low to moderate intensity also have great importance in the control of various risk factors associated with MS and with NCD and can be used in regenerative periods during breaks between TF or high intensity interval training. Recalling that the EF aerobics should be performed in a controlled manner inappropriate for an increase in the frequency, duration and intensity can generate higher risk of cardiac complications and orthopedic problems, and should be subject to the propositions developed in the body of work for the safe practice of such activity.

This study sought to examine factors related to the EF regular practice, related to the NCD, future studies will be necessary and important for more precise statements about the subject.

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THE ANTI-INFLAMMATORY EFFECT'S PHYSICAL EXERCISE IN THE PREVENTION OF CHRONIC CHRONIC NONCOMMUNICABLE DISEASES

ABSTRACT

The NCDs are the leading cause of death worldwide, and are associated with functional disabilities. The main installation mechanisms of NCDs are chronic subclinical inflammation, insulin resistance and MS. All these mechanisms are associated with the presence of proinflammatory substances in the body. From these data it was observed that the EF appears in a prominent position in the prevention of these diseases, because it alters the body composition and physiological markers such as heart rate and blood pressure, also acts as anti-inflammatory agent. Thus the work has as main objective to analyze the mechanisms of prophylactic EF regarding installation of NCDs, as well as specific goal: Aim kinds of effective exercises for an anti-inflammatory action, with respect to NCDs. Therefore, we performed a systematic literature review conducted in electronic databases, books and articles, using the area as important authors Pedersen, Jose Maria Santarém, Neil Walsh, Petersen, Carnevali Jr. has been observed so exercises more intense and of limited duration, such as TF, are safer to prevent DCNT, and must be used as a central part of a program for training, aerobic exercises while low intensity can be used in regenerative periods provided they are controlled.

KEYWORDS: Exercise, Inflammation, NCD.

EFFET ANTI-INFLAMMATOIRE DE L'EXERCICE SUR LA PRÉVENTION DES MALADIES CHRONIQUES NON TRANSMISSIBLES

RÉSUMÉ

Les maladies non transmissibles sont la principale cause de décès dans le monde, et sont associés à des incapacités fonctionnelles. Les principaux mécanismes d'installation des maladies non transmissibles sont l'inflammation chronique subclinique, résistance à l'insuline et le SM. Tous ces mécanismes sont associées à la présence de substances pro-inflammatoires dans le corps. A partir de ces données, il a été observé que l'EF apparaît dans une position de premier plan dans la prévention de ces maladies, car il modifie la composition corporelle et des marqueurs physiologiques comme le rythme cardiaque et la pression sanguine, agit également comme agent anti-inflammatoire. Ainsi, le travail a pour principal objectif d'analyser les mécanismes de traitement prophylactique EF concernant l'installation des maladies non transmissibles, ainsi que des objectifs spécifiques: Objectif sortes d'exercices efficaces pour une action anti-inflammatoire, en ce qui concerne les maladies non transmissibles. Par conséquent, nous avons effectué une revue systématique de la littérature réalisée dans des bases de données électroniques, des livres et des articles, en utilisant la région comme auteurs importants Pedersen, Jose Maria Santarém, Neil Walsh, Petersen, Carnevali Jr. a été observé exercices plus intense et d'une durée limitée, comme TF, sont plus sûrs pour éviter dcnt, et doit être utilisé comme un élément central d'un programme de formation, des exercices d'aérobie de faible intensité tout en pouvant être utilisées dans les périodes de régénération à condition qu'ils soient contrôlés.

MOTS CLÉS: exercice, l'inflammation, MCNT.

EFECTO ANTIINFLAMATORIO DEL EJERCICIO EN LA PREVENCIÓN DE ENFERMEDADES CRÓNICAS NO TRANSMISIBLES

RESUMEN

Las enfermedades no transmisibles son la principal causa de muerte en el mundo, y se asocian con discapacidades funcionales. Los mecanismos de instalación principales de las enfermedades no transmisibles son la inflamación crónica subclínica, la resistencia a la insulina y el SM. Todos estos mecanismos se asocia con la presencia de sustancias proinflamatorias en el cuerpo. A partir de estos datos, se observó que el EF aparece en una posición prominente en la prevención de estas enfermedades, ya que altera la composición corporal y los marcadores fisiológicos tales como la frecuencia cardíaca y la presión arterial, actúa también como agente anti-inflamatorio. Así, el trabajo tiene como principal objetivo analizar los mecanismos de profilaxis EF respecto a la instalación de las enfermedades no transmisibles, así como los objetivos específicos: tipo objetivo de los ejercicios eficaces para una acción anti-inflamatoria, con respecto a las enfermedades no transmisibles. Por lo tanto, se realizó una revisión sistemática de la literatura realizada en bases de datos electrónicas, libros y artículos, utilizando la zona como autores importantes Pedersen, José María Santarém, Neil Walsh, Petersen, Carnevali Jr. se ha observado hasta ejercicios más intensa y de duración limitada, tales como TF, son más seguros para prevenir DCNT, y debe ser utilizado como una parte central de un programa para la formación, mientras que los ejercicios aeróbicos de baja intensidad se pueden utilizar en períodos regenerativos siempre que se controlan.

PALABRAS CLAVE: Ejercicio, inflamación, ECNT.

O EFEITO ANTIINFLAMATÓRIO DO EXERCÍCIO FÍSICO NA PREVENÇÃO DE DOENÇAS CRÔNICAS NÃO TRANSMISSÍVEIS

RESUMO

As DCNT são a principal causa de morte no mundo, e estão associadas a deficiências e incapacidades funcionais. Os principais mecanismos de instalação das DCNT são a inflamação crônica subclínica, a resistência à insulina e a SM. Todos estes mecanismos estão associados à presença de substâncias pró-inflamatórias no organismo. A partir dessas informações observou-se que o EF aparece em posição de destaque na prevenção destas doenças, pois o mesmo além de alterar a composição corporal e marcadores fisiológicos como frequência cardíaca e pressão arterial, também atua como agente anti-inflamatório. Deste modo o trabalho possui como objetivo geral, analisar os mecanismos profiláticos do EF em relação à instalação de DCNT, assim como objetivo específico: Apontar os tipos de exercícios eficazes, para uma ação anti-inflamatória, com relação às DCNT. Para tanto, foi realizada uma revisão sistemática da literatura, realizada em bases de dados eletrônicas, livros e artigos, utilizando-se de autores importantes da área como Pedersen, José Maria Santarém, Neil Walsh, Petersen, Carnevali Jr. Foi observado assim que exercícios mais intensos e de duração reduzida, como o TF, são mais seguros para a prevenção de DCNT, e devem ser utilizados como parte central de um programa de treinamento, enquanto exercícios aeróbicos de baixa intensidade podem ser utilizados em períodos regenerativos, desde que sejam controlados.

PALAVRA- CHAVE: Exercício Físico, Inflamação, DCNT.