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RESEARCH ARTICLE

HIIT TRAINING AS A CONTROL OF OBESITY AND METABOLIC DYSFUNCTIONS

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ABSTRACT

Obesity is a complex and multifactorial disease, characterized as an important public health problem today. Due to lack of physical activity and eating habits, also related metabolic dysfunctions that increase the possibility of developing diseases. Studies using HIIT (High-Intensity Interval Training) have the advantage of promoting adaptations similar to continuous aerobic training, but in a time-efficient way in obese individuals. Carry out a narrative review of periodical publications on HIIT training as a control of obesity and metabolic dysfunctions. Literature review, to answer the following question "How can HIIT training control obesity and metabolic dysfunctions?" The literature search occurred through the electronic search resources in the following databases: Scientific Electronic Library Online (SciELO) and PubMed - National Library of Medicine, from 2000 to 2016. Eight articles selected, one of which addresses that most people do not perform more than 10 minutes of mild or moderate activity in daily life, another states that obesity is a complex disease, of multiple etiologies and common enough to constitute a public health problem. Two papers from selected studies show that HIIT enhances the mitochondrial and oxidative capacity of skeletal muscle and improves performance and endurance in exercise and performance. Four of the studies selected indicate that HIIT decreases fat levels, increases lean mass, reduces hyperglycemia in type 2 subjects, and lowers HDL cholesterol levels. The results found in this study demonstrate that HIIT is efficient for the reduction of fat levels in obese, decrease of metabolic dysfunctions and improvement of performance and resistance in exercise and performance, being shown as a possible solution in the control of obesity and metabolic dysfunctions.

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INTRODUCTION

In recent decades, obesity has proved to be a powerful disease, its etiology is complex and multifactorial. It encompasses genetic factors, hormonal, sociocultural, psychological changes, decreased energy expenditure, increased food intake and sedentary lifestyle. The lack of physical activity is one of them and is directly linked to the sedentary life, causing damage to the health of a large part of society (SALVE, 2006; ROCHA *et al,* 2016). Characterized by the increase in total body weight, obesity has ceased to be a particular problem to become a major public health problem today. Its prevalence has been increasing in the last decades throughout the world, especially in developed countries, also affecting developing countries (TERRES *et al* 2006; LIMA, 2007). According to the World Health Organization (WHO) today, 40% of the entire world population is overweight, three times more than 40 years ago. (WHO, 2018).

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One of the reasons for this worldwide increase is due to the reduction of energy expenditure due to the technological advance, generating more comfort to the individuals, reducing their body movements during the day (GIGANTE, MOURA *et al*, 2009). Another point to be highlighted is related to eating habits, such as the greater participation of Fast Food, industrialized foods in diets, higher consumption of meat, milk and high-fat derivatives, and reduction of consumption of fruits, cereals, vegetables and vegetables, which, together with the progressive decrease of physical activity (ALMEIDA *et al* 2002, MARIATH *et al*., 2007). The increase in body mass in the form of fatty tissue is related to the appearance of several metabolic dysfunctions that increase the probability of developing diseases, such as Arterial Hypertension, Diabetes Mellitus, Dyslipidemias, among others (MARTINS *et al* 2003; NETO *et al*, 2012). Physical exercises are recommended as an essential component of a weight loss and weight management program, as well as in health promotion and maintenance, among them High-Intensity Interval Training (HIIT), which is an exercise method consisting of in periods of high intensity and short rest pauses (ROCHA *et al*, 2016). HIIT refers to

periods of intense exercise alternated with periods of active recovery or rest (HELGERUD *et al*., 2007). It is a relatively time-efficient training strategy to rapidly increase oxidative energy capacity and induce physiological remodeling that is similar to the changes normally promoted by continuous moderate-intensity aerobic training (GIBALA *et al*, 2014; GILLEN *et al*, 2014). Overall, the studies demonstrate a potential for the application of HIIT to obese individuals, with the great advantage of promoting adaptations similar to continuous aerobic training, but in a time-efficient manner. HIIT is thus an interesting training modality to investigate the mechanisms by which physical training can improve insulin sensitivity in obese individuals (MATOS, 2016).

Objective

To analyze the effects of HIIT training applied to people with obesity and metabolic dysfunctions.

MATERIALS AND METHODS

The present study has as a method the literature review, to answer the following question "How can HIIT training control obesity and metabolic dysfunctions? "The bibliographic search occurred through the search engines constituted by electronic resources in the following databases: Scientific Electronic Library Online (SciELO) and PubMed - National Library of Medicine, from 2000 to 2016.

RESULTS

Many articles found did not meet the inclusion criteria, were not available in the databases, were incomplete, or appeared in duplicate and did not discuss the topic. Among those analyzed and meeting the inclusion criteria, eight articles were selected from the period 2000 to 2016, some of them being national, other international. Lippincott *et al*, argues that most people do not perform more than 10 minutes of light or moderate activity in daily life, and it is recommended that an average of 30 minutes of daily physical activity be performed five times a week to promote (LIPPINCOTT *et al*., 2000). Mancini 2001, points out that obesity is a complex disease, of multiple etiologies and sufficiently common to constitute a public health problem, as well as an important clinical dilemma. Being a universal disease of increasing prevalence and that has acquired alarmingly epidemic proportions, being one of the main public health problems of modern society. At the same time, both the research of etiopathogenic factors and of drugs with action in several sites has been growing, collaborating to the acceptance that obesity is a disease that can be prevented and treated. Gibala *et al* 2008 and Little *et al* 2010, show that HIIT increases mitochondrial and oxidative capacity of skeletal muscle and improves performance and resistance in exercise and performance (GIBALA *et al*., 2008; LITTLE *et al*., 2010). Four of the studies selected from the authors Boudou *et al* 2003, Geremia *et al* 2014, Santos *et al* 2016 and Santos *et al* 2016, indicate that HIIT decreases fat levels, increases lean mass, reduces hyperglycemia in type 2 subjects, and decreases HDL cholesterol levels (BOUDOU *et al*., 2003; GEREMIA *et al*., 2004; SANTOS *et al*., 2016; SANTOS *et al*., 2016).

DISCUSSION

Considering to be a narrative review of literature, this research is limited in highlighting the importance of HIIT in the control of obesity and metabolic dysfunctions.

Obesity has attracted special attention to studies and research. The articles found point out that the subject has generated concern because it is a complex disease and of multiple etiologies (MANCINI, 2001). The fact that obesity is highlighted in research over the years, raises the hypothesis that the current rhythm of life, the technological advance and the reduction of the energy expenditure generate more comfort to the individuals, reducing their body movements during the day, raising the incidence of obese individuals (GIGANTE, MOURA *et al*, 2009). Other authors also point to obesity as a powerful disease, with a large worldwide increase due to its multifactoriality, which encompasses genetic factors, hormonal, sociocultural, psychological alterations, decreased energy expenditure, increased food intake and sedentary lifestyle (SALVE, 2006; *et al*, 2016). As for sedentarism, the study by Lippincott *et al*, (2000), despite being written 18 years ago, draws attention to the lack of daily physical activity (LIPPINCOTT *et al*., 2000). Current studies also point to sedentarism as a worrying fact, and researchers have sought to deepen studies in the search for better health conditions of this population, mainly in the identification of behavioral factors related to health problems and that enable the implementation of strategies for health promotion and prevention of diseases (SILVA *et al*., 2011, MENEGUCI *et al*., 2016). Journal of Aging and Health report that the search for healthy lifestyle change is possibly related to the increase in the prevalence of chronic diseases over the years and high prevalence of functional disability (Lin S-F, *et al*., 2012). It is also observed a high index of sedentarism among individuals, which has been considered one of the major concerns of the world public health (Allende *et al*. The regular practice of physical activity has been pointed out as a functionally related factor to the promotion of individuals' health and to the prevention of certain conditions of risk to diseases (SILVA *et al*., 2011).

As for HIIT, the four studies selected from the authors Boudou *et al* 2003, Geremia *et al* 2014, Santos *et al* 2016 and Santos *et al* 2016, report decreases fat levels, increases lean body mass, reduces hyperglycemia in type 2 subjects, and lowers HDL cholesterol levels (BOUDOU *et al*., 2003, GERMANY *et al*., 2004; SANTOS *et al*. al., 2016, SANTOS *et al*., 2016). These results agree with Almeida *et al* 2017, which points to HIIT as the most effective method for reducing adipose body mass when compared to other aerobic and anaerobic training models. In addition, the possibility of adapting the HIIT protocols according to the needs, makes it an attractive and pleasurable activity (ALMEIDA *et al*., 2017). Dias et. (2014) points out that for an exercise program to play a positive role in body weight control (whether it is the HIIT or the traditional method), it should be prescribed on a consistent methodological basis, involving some components such as: duration of exertion , intensity of effort, weekly frequency of activities, type of activity performed and form of training progression. All of these components together should be organized in a way that causes a negative energy balance, which may lead to an improvement in the body composition of the practitioners, including the reduction of body fat and the increase of lean body mass (DIAS *et al*., 2014). Parolin (2016), highlights that HIIT has been outstanding because it is a fast and efficient method, especially among obese and overweight. Brabaj (2009) points to HIIT as an alternative to promote greater improvements in a shorter time and increase motivation and adherence to exercise programs (BRABAJ, 2009). Studies that report metabolic alterations in people with obesity and overweight. Other studies also indicated improvements, Racil

et al (2013) performed a study with 34 obese adolescents during 12 weeks and it was observed that at the end there was a decrease in body fat, an increase in VO2max and an improvement in insulin sensitivity. Tjonna *et al* (2013) reported a reduction in body fat and cholesterol, an increase in VO2max, a decrease in blood pressure and glycemia in a study of 26 sedentary, overweight men who performed three sessions per week for ten weeks. Dalzill *et al* (2014) who conducted a study of 55 subjects for nine months with 2 to 3 sessions of HIIT per week observed the reduction of body fat, improvement in VO2max and insulin sensitivity and increased muscle endurance. Studies by Gibala *et al* 2008 and Little *et al* 2010, showed that HIIT increases mitochondrial and oxidative capacity of skeletal muscle and improves performance and resistance in exercise and performance (GIBALA *et al*., 2008; LITTLE *et al*., 2010). Few studies have not shown statistically significant results in obese subjects (Alkatah *et al*., 2013) and in untreated individuals with overweight (KEATING *et al*., 2014).

Conclusion

The results found in this study demonstrate that HIIT is efficient for reducing fat levels in obese individuals, reducing metabolic dysfunctions and improving performance and endurance in exercise and performance, proving to be a possible solution in the control of obesity and dysfunction metabolic diseases.

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