Science & Sports (2017) xxx, xxx—xxx

Disponible en ligne sur ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com

ORIGINAL ARTICLE

Influence of the level of physical activity on physical fitness, lipid profile and health outcomes in overweight/obese adults with similar nutritional status

Influence du niveau d'activité physique sur la condition physique, la composition corporelle et le profil lipidique dans une population d'adultes en surpoids ou obèses

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Received 30 June 2015; accepted 27 May 2016

KEYWORDS
Cardiorespiratory fitness;
Muscle strength;
Weight management;
Metabolic syndrome

Summary
Objective. — To determine the influence of the level of physical activity on physical fitness, body composition and lipid profile and further explore the associations between fitness with these health outcomes in a population of overweight/obese adults.
Methods. — Forty overweight/obesity participants with a caloric intake between a negative balance of 500 kcal/day and their estimated required energy intake were classified according to their level of physical activity. Anthropometric (weight and height), body composition (waist-to-hip ratio, percentage of body fat and fat-free mass), clinical measurements (blood pressure), physical fitness (cardiorespiratory fitness — 6MWT —, handgrip strength and lower-limb muscle strength — MVC —) and lipid profile (total cholesterol — TC —, low — LDL — and high-density lipoprotein cholesterol — HDL —, triglyceride — TG —, and plasma glucose) were determined.

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http://dx.doi.org/10.1016/j.scispo.2016.05.006

Please cite this article in press as: Muñoz-Vera T, et al. Influence of the level of physical activity on physical fitness, lipid profile and health outcomes in overweight/obese adults with similar nutritional status. Sci sports (2017), http://dx.doi.org/10.1016/j.scispo.2016.05.006

Results. — Significant differences in MVC and fat-free mass were found between participants with different physical level. Significant associations between all the body composition measures and the strength-related variables (handgrip and MVC) in both physical activity categories also were found. In addition, associations between triglycerides, LDL and total cholesterol with muscle strength and cardiorespiratory fitness were observed only in the low physical activity group. Moreover, MVC explained up to 39% of the variance in metabolic syndrome in those with a moderate level of physical activity.
Conclusions. — Correlations between physical fitness (especially in strength) and health risk factors depending on the level of physical activity were found.

MOTS CLÉS
Aptitude cardiorespiratoire ;
Force musculaire ;
Gestion du poids ;
Syndrome métabolique

Résumé
Objectif. — Déterminer l'influence du niveau d'activité physique sur la condition physique, la composition corporelle et le profil lipidique, ainsi que préciser les associations entre aptitude physique et ces paramètres biologiques dans une population d'adultes en surpoids ou obèses.
Méthodes. — Quarante participants en surpoids ou obèses recevant des apports caloriques compris entre leurs besoins énergétiques et une restriction de 500 kcal/jour ont été classés en fonction de leur niveau d'activité physique, et comparés sur le plan des données anthropométriques (poids et taille), de la composition corporelle (rapport taille/hanche, pourcentage de graisse corporelle et masse maigre), de la pression artérielle, de la condition physique (test de marche de 6 minutes, aptitude cardiorespiratoire, la force de préhension et de la force musculaire des membres inférieurs), du profil lipidique (cholestérol total, cholestérol LDL et HDL, triglycérides et glycémie).
Résultats. — Des différences significatives au niveau de la force musculaire des membres inférieurs cholestérol et de la masse maigre s'observent entre les groupes de niveau d'activité physique différent. Des associations significatives entre toutes les mesures de la composition corporelle et les variables liées à la force (préhension et force musculaire des membres inférieurs) sont observées dans les deux catégories d'activité physique. Une association des paramètres lipidiques (triglycérides, cholestérol LDL et cholestérol total) avec la force musculaire l'aptitude cardiorespiratoire n'a été observée que dans le groupe à faible activité physique. Par ailleurs, la force musculaire des membres inférieurs explique jusqu'à 39 % de la variance du syndrome métabolique chez les sujets ayant un niveau modéré d'activité physique.
Conclusions. — Des corrélations différentes entre la condition physique (en particulier la force musculaire) et les facteurs de risque pour la santé ont été trouvés en fonction du niveau d'activité physique. La force musculaire des membres inférieurs est un important déterminant statistique du syndrome métabolique chez les sujets à faible niveau d'activité physique.

1. Introduction

Metabolic syndrome is characterized by the co-occurrence of central obesity, hypertension, dyslipidemia and hyperglycemia, which represent significant risk factors for cardiovascular disease [1]. This cluster of related metabolic abnormalities is strongly linked with overweight and obesity and is affecting a wide range of people in all age groups. According to the World Health Organization, by 2015, an estimate of ~2.3 billion adults worldwide are expected to be overweight (body mass index [BMI] $\geq$ 25 kg/m^2) and at least 700 million obese (BMI $\geq$ 30 kg/m^2). Therefore, this pandemic is one of the main public health challenges, and identifying risk factors and strategies for prevention and treatment of these conditions are an important public health issue.

Obesity results from an imbalance between nutritional intake and energy expenditure and it is well established that physical activity levels and diet, either independently or in combination, are associated with this disease. We have now evidence that low physical activity levels and excessive energy intake are associated with obesity [2—5] and therefore higher levels of physical activity are associated with several metabolic consequences and a lower incidence of obesity [6]. Thus, changes in lifestyle such as modifications in diet and exercise are considered to be the cornerstones of obesity management [7,8].

Physical activity is thought to positively influence energy balance increasing energy expenditure [6] but also has positive effects on the metabolism of skeletal muscle and insulin sensitivity [8]. Even low levels of physical activity may contribute to maintain a favorable metabolic profile [9], inducing the clearance of triglycerides [10]. Furthermore, changes in physical activity and fitness are inversely correlated with changes in body weight, body mass index (BMI), waist circumference and abdominal adiposity [11—13] and a dose—response relationship has been reported between the amount of exercise and changes in visceral adipose tissue in obese participants [13,14]. In addition, handgrip strength, considered a popular marker of nutritional

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