

Original Article

Body composition, physical fitness and exercise activities of elderly

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Abstract:

Ageing is a natural and inevitable process with degenerative changes in most of the physical, physiological, psychological and social functions. Furthermore, the ageing process has an impact on the body composition and physical fitness of elderly people. Changes in body composition are considered one of the major causes of chronic diseases of ageing people. In addition, body composition is an important marker of health and predictor of comorbidities. Hence, from a clinical point of view, it is interesting to appreciate the changes through variations in body composition while age is linearly increasing because the states of body composition are related to the ageing. Furthermore, the association between physical fitness and physical activity and the benefits this provides for elderly people has been explained in great detail in several studies. The main objective of exercise is the improvement or maintenance of physical fitness. Exercise produces benefits in the mobility of elderly people and is effective in the treatment and prevention causes of morbidity and mortality. In conclusion, there is a general opinion in the literature about the changes of body composition in elderly people and the benefits of exercise on physical fitness and control of body composition. Therefore, higher emphasis might be focused in the improvement of ageing and body composition in elderly people through the practice of physical exercise.

Key Words: Fat mass, fat-free mass, physical activity, prevention

Introduction

The definition of “elderly” is not yet a global term. Clinical and medical context often uses elderly with people over 65 years (Teymoortash et al., 2014), but all reports, documents, books and international meetings of The World Health Organization (WHO) employs elderly when the person in question is over the age of 60. Nonetheless, people over the age of 60-65 are a great achievement for humanity (WHO, 2002) because not long ago, most people did not live into old age. Moreover, the ageing is a natural and inevitable process (Amarya, Singh, & Sabharwal) related to lack of adjustment in the immune system, “immunosenescence” (Castillo-Garzon, Ruiz, Ortega, & Gutierrez, 2006), affecting to living organisms and representing continuous degenerative changes in most physical and physiological functions (Trifunovic & Ventura, 2014).

Fat mass (FM) increases and fat free mass (FFM) decreases during the period of 20-70 years of age (Colado, Garcia-Masso, Rogers, Tella, Benavent, & Dantas, 2012). Maximum levels FM are found between 60-70 years of age (Gallagher et al., 1997). However, maximum levels of FFM is at 20 years of age and up to 40% decrease until 70 years of age, primarily skeletal muscle (Baumgartner, Stauber, McHugh, Koehler, & Garry, 1995). Ageing is associated with the redistribution of FM and FFM in the body (Amarya et al., 2014) and may be an important risk factor for metabolic disease (Alemán, Esparza, & Valencia, 1999). When there is an increase in FM, there is a reduction in SMM and physical capacity, along with a loss of FFM (Katula, Sipe, Rejeski, & Focht, 2006). An elderly, with more sedentary lifestyles, lose FFM faster than an elderly who is active. Consequently, there is prevention of weight loss and in maintaining functional capacity in people over the age of 70 (Woo, Yu, & Yau, 2013).

The level of FM increases and FFM decreases among the elderly due to changes in body composition. This is the major drawback of body mass index (BMI) (Amarya et al., 2014). However, BMI is a suitable method when it is necessary to classify medical risk by weight status (Kumanyika, Brownson, & Satcher, 2007), such as obesity (Dudeja, Misra, Pandey, Devina, Kumar, & Vikram, 2001).

Obesity is an excess of body fat that increases considerably the risk of mortal illness (Kumanyika et al., 2007). It is also considered a widespread health problem in developing countries, where it is accompanied by chronic morbidities, functional impairment and premature mortality (Donini, Chumlea, Vellas, del Balzo, & Cannella, 2006). Obesity is classified into three categories (principal cut-off points): type I (30.00-34.99), type II (35.00-39.99) and type III (≥ 40.00) (WHO, 2000). Excess of FM and a BMI of ≥ 30 in elderly people is

associated with worse physical fitness, possible future disability (Davison, Ford, Cogswell, & Dietz, 2002) and excess body weight, (Chen et al., 2004) while obesity (Daviglius et al., 2004) is associated with the major prevalence of diseases such as diabetes, hypertension, cardiovascular risk, etc. Similarly, excess weight and obesity is strongly associated with metabolic syndrome (Yu et al., 2009) as was described in a Malaysian study on elderly women (Johari & Shahar, 2014). It is, therefore, necessary to establish containment plans concerning potential risks of obesity and excess weight in elderly people with the main aim being to effectively tackle morbidity (Gu et al., 2003). A method of prevention could be a reduction in weight when people reach middle-age (Chuang, Chang, Lee, Chen, & Pan, 2014). However, weight loss in elderly people would be associated with risk of mortality if we compared this to elderly people maintaining a stable weight (Newman, Yanez, Harris, Duxbury, Enright, & Fried, 2001).

Body composition, FM and skeletal muscle mass (SMM) are related to physical capacities (Colado et al., 2012) when the obesity is observable with an increase of FM and sarcopenia with a loss of SMM (Katula et al., 2006). In addition, the physical activity maintains muscle strength in elderly people and muscle strength might be a reflection of SMM. Normally, SMM must always be measured because it may identify elderly people with a high level of mortality risk (Chuang, Chang, Lee, Chen, & Pan, 2014). For example, poor muscle strength is associated with a greater probability of mortality in patients with cardiovascular risks (Singh et al., 2010) and a stronger grip and quadriceps are associated with a lower mortality risk (Newman et al., 2006).

Prevalence of sarcopenia is exclusive in elderly people (Chien, Huang, & Wu, 2008) but there is a different range of sarcopenia depending on the country (Wen, Wang, Jiang, & Zhang, 2011) and the diagnostic criteria (Pagotto & Silveira, 2014). Sarcopenia is a typical progressive process of ageing (Emerson et al., 2014), where a loss of SMM and strength is observable (Tanimoto et al., 2014). Early post-menopause negatively influences sarcopenia (Bemben, Feters, Bemben, Nabavi, & Koh, 2000), specifically in feminine gender (Doherty, 2003). According to some authors (Baumgartner et al., 1995; Lima et al., 2009), there is growing evidence that functional disability in elderly people is attributed to sarcopenia. Moreover, sarcopenia is a source of concern for public health systems due to the high cost this entails, especially in industrialized countries (Lynch, 2004). There are authors who suggest recognizing sarcopenia as a geriatric syndrome because, by doing so, the identification of such would be faster and easier (Cruz-Jentoft, Landi, Topinkova, & Michel, 2010).

Importance of nutrition and diet

Diet should be taken into account with respect to longevity and healthier elderly people (Cai et al., 2015). The association of poor nutritional status and lack of strength is considered a risk factor for mortality (Rantanen, Volpato, Ferrucci, Heikkinen, Fried, & Guralnik, 2003). Obesity and weight play an important part in health due to the influence that the diet has on the psycho-social aspects of life (Ovrum, Gustavsen, & Rickertsen, 2014). Furthermore, adequate diet is essential in the treatment of obesity (Amarya et al., 2014). The habits and frequency of family meals can influence the dietary behavior and body weight parameters of people (Nuvoli, 2015).

Observational studies and previous investigations have highlighted the need of nutrients and diet in the prevention of metabolic disorders in all populations (Szic, Declerck, Vidakovic, & Berghe, 2015). The role of nutrients and food has been the main aim of nutrition and healthy aging researches. However, the interest of dietary pattern analysis is currently considered to be a determinant of chronic diseases (Ovrum et al., 2014). The quality of the diet is related to depression and anxiety in elderly people (Jacka, Mykletun, Berk, Bjelland, & Tell, 2011) and a better quality diet brings about/suggests better quality of life in elderly women (Milte, Thorpe, Crawford, Ball, & McNaughton, 2015).

Several international dietary guidelines recommend consuming a variety of healthy foods such as vegetables, fruits, grains, meat and alternatives as the best option (Milte et al., 2015). The Mediterranean diet is considered an appropriate diet for elderly people as it has been associated with a decrease of cardiovascular diseases risks (Bonaccio et al., 2013). A main aspect of the Mediterranean diet is a low intake of fat, sodium and processed foods whereas there is a high intake of fruit and vegetables (Fung, Chiuve, McCullough, Rexrode, Logroscino, & Hu, 2008). Other dietary patterns such as low carbohydrate intake or the vegetarian diet can be adapted to personal and cultural food preferences in order to prevent some cardiometabolic diseases (Van Gaal & Maggioni, 2014). Thus, good knowledge regarding nutrition is necessary in order to get a better quality diet (Geaney, Fitzgerald, Harrington, Kelly, Greiner, & Perry, 2015).

Results

Three steps search strategies were conducted in the present study. First, the most important data bases (ISI Web of Knowledge: Social Sciences-Thomson Reuters y Scopus-Elsevier) were searched for all used publications from 1993 to 2015 that contained at least one keyword related to “body composition”, “physical fitness”, “exercise”, “aging” and “elderly”. Secondly, combinations of keywords were entered into the data bases and Google Scholar later. Selection of publications used in the present study was made on the basis of general

criteria: relevancy of the article according to rest of science area and quality of the data base where they are located. A total of 27 publications are related to body composition in elderly whereas 38 publications combine the keywords cited before.

As a result, physical fitness is a reliable predictor of life expectancy in elderly women (Castillo-Garzon et al., 2006). The association between physical fitness and physical activity and the benefits this provides for elderly people has been explained in great detail in several studies (Landi, Onder, Carpenter, Cesari, Soldato, & Bernabei, 2007). Elderly people do not enjoy complete well-being due to the fact that they suffer from physical limitations which are commonly found in old age (Yeom, Fleury, & Keller, 2008) and associated with the limitations of physical fitness (Ferrucci, Guralnik, Studenski, Fried, Cutler, & Walston, 2004). Physical inactivity and sedentary lifestyles are both causes of negative health consequences (Ikezoe, Asakawa, Shima, Kishibuchi, & Ichihashi, 2013).

Dicussion

Exercise produces benefits in the mobility of elderly people (Liu & Latham, 2009) and is effective in the treatment and prevention causes of morbidity and mortality (Castillo-Garzon et al., 2006). In addition, the exercise capacity is a high predictor of overall mortality rates in elderly (Kokkinos et al., 2008). Previous studies have shown the connection between active lifestyle habits and regular exercise and improved physical fitness in elderly people (Chodzko-Zajko et al., 2009; Almeida & Neves, 2014). Exercise carried out frequently improves independent lifestyle in elderly people due to a reduction of FM and obesity (Hayes et al., 2013). Similarly, exercise produces a reduction in inflammation and chronic diseases (Handschin & Spiegelman, 2008) such as pressure levels (Pescatello, 2005).

According to Castillo-Garzón et al. (2006), physical fitness is an integrated measurement of skeletomuscular, cardiorespiratory, hematocirculatory, psychoneurological, and endocrine-metabolic functions. The same authors confirm that the assessment of physical fitness might be considered as an important indicator of health and life expectancy. Physical fitness is used as an important predictor of the causes of mortality and the possibility of independent life in elderly people, even in overweight and obese people (Blair & Brodney, 1999). Most physical fitness evaluations carried out on the elderly are characterized by a measurement of muscular strength and body composition (Misic, Rosengren, Woods, & Evans, 2007).

Body composition is a component of good health and disease prevention associated with physical fitness (Castillo-Garzón et al., 2006). Body composition, physical fitness and loss of strength are related to neuromuscular fatigue (Emerson et al., 2014). Changes in body composition in sedentary elderly people can be reversed, at least partly, by exercise programs. The levels of FM, FFM and SMM can be healthier with the regular practice of exercise (Gomez-Cabello, Rodriguez, Vila-Maldonado, Casajus, & Ara, 2012). Thus, moderate to high-intensity resistance exercise training is necessary in order to decrease the percentage of total FM (Hunter, Bryan, Wetzstein, Zuckerman, & Bamman, 2002).

Moreover, resistance training is helpful when wanting to lose specific subcutaneous adipose tissue in elderly women such as Hunter et al. study (2002), where there was a 12% reduction after a 25-week interventional program of strength and resistance exercises. The combination of strength and aerobic exercise may be more effective on the cardiovascular system and SMM than separately (Chodzko-Zajko et al., 2009)

Conclusions

In conclusión, changes in body composition are considered one of the major causes of chronic diseases of ageing people (Kyle, Morabia, Schutz, & Pichard, 2004) and have become a primary concern (Bae, Kang, Suh, Han, Kim, & Shim, 2013). During the ageing process, the body shows a decrease in physical capacities and other changes such as fat mass, skeletal muscle mass or metabolic rates (Carter, Williams, & Macera, 1993). Body composition is an important marker of health and predictor of comorbidities (Ruiz-Montero, Castillo-Rodriguez, Mikalački, Cokorilo, & Korovljević, 2013). Thus, the physical fitness is a reliable predictor of life expectancy in elderly women (Landi et al., 2007). In addition, the relationship of health and physical fitness is associated with the body composition and physical fitness (Milanovic, Pantelic, Trajkovic, Sporis, Kostic, & James, 2013; Motalebi, Iranagh, Abdollahi, & Lim, 2014).

Conflicts of interest - The authors of the present study declare not have any conflicts of interest.

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