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Physical Education

IMPACT OF EXERCISE AND PHYSICAL ACTIVITY ON SUCCESSFUL AGEING OF OLDER ADULTS

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ABSTRACT Aging is a natural and physiological process influenced by so many factors such as intrinsic factors, extrinsic factors and disease. For healthy ageing healthy dietary and exercise habits may be used. Besides healthy balanced diet and psychosocial well-being, the benefits of physical activities and regular exercise on mortality and the prevention of chronic disease that affects both life expectancy and quality of life are well established. The purpose of this article is to throw some rays on how physical activity and regular exercise slows down the natural process of aging. There is encouraging evidence that moderate levels of exercise and physical activity may provide protection from certain chronic diseases and thus slowing down aging process effectively.

KEYWORDS : Exercise, Physical activity, aging, older adults

1. Introduction

The older adults are the fastest growing segment of the population now-a-day. It has been estimated that the number of centenarians will approach 3.2 million world-wide by 2050, a greater than 18-fold increase from the turn of the 21st century (UN, 2000). With the increasing emphasis on health and the progressive lengthening of the average life span, there is a need for examining new ways to improve well-being and to prevent disease at every stage of life.

Determinants of successful aging has led to the investigation of the heterogeneity in health and physical performance abilities within groups of higher functioning older people (Rowe and Khan, 1998). Exercise and physical activity are known to provide a myriad of specific psychological and psychosocial benefits to older people (Pescatello and DiPietro, 1993; Stewart and King, 1991; Haskell and Phillips, 1995). Exercise is planned, structured and repetitive activity with an objective to improve as well as to maintain physical fitness (Hammer and Ostregen, 2013). By exercise body performs work of demanding nature, in accordance with muscle and joint function in a clinically-controlled environment in order to strengthen muscular structures within minimum time. Physical activity is the process of bodily movement produced by skeletal muscles resulting in energy expenditure which is generally measured in kilocalories. Regular physical activity increases longevity and decreases risk of chronic diseases of ageing, mitigates the physiological changes of ageing in a sedentary society and assists in maintaining independence and preventing disability (Singh 2002).

Aging is a natural, physiological and complex process influenced by many factors such as genetic factors, psychosocial and environmental factors and disease factors (Glatt, 2007; lupine, 2004). With the advancement of age, structural and functional deterioration occurs in most physiological systems, even in the absence of discernible disease. These age-related physiological changes affect a broad range of tissues, organ systems, and functions, which, cumulatively, can impact activities of daily living (ADL) and the preservation of physical independence in older adults.

The purpose of this article is to describe how exercise and physical affects the aging process as well as physical fitness of older adults.

2. Types of aging

2.1 Normal aging

Gene-related decline in physiological functions and processes in known as normal aging. It may lead to frailty when the body's physiological reserve can no longer adapt to environmental challenges (Fleg et. al , 2005). In addition to the changes in cardiovascular and muscle systems, skeletal response to exercise is altered with age (Lanyon and Skerry, 2001). Mechanical loading forces become less effective in eliciting an oestrogenic effect with increasing age, suggesting a progressive loss of bone sensitivity to chemical and physical signals (Rubin et. al, 1992).

2.2 Pathological aging

Pathological aging is the accelerated aging process caused mainly by various diseases that occur during the life course. These may include cardiovascular disease, metabolic abnormalities, cancer, dementia, depression, impaired locomotion, and sensory disturbances. These conditions are frequently associated with under nutrition and malnutrition, which in itself are associated with poorer prognosis among the elderly (Ahmed and Haboubi, 2010).

2.3 Successful aging

Biomedical theories define successful ageing largely in terms of the optimisation of life expectancy while minimising physical and mental deterioration and disability. They focus on the absence of chronic disease and of risk factors for disease; good health as well as high levels of independent physical functioning, performance, mobility, and cognitive functioning. It also refers to the maintenance of physical and mental well-being and functional independence in the absence of chronic disease, the ability to adapt to change, and the ability to compensate for limitations. The capacity to age successfully is highly variable from one individual to another (Hank, 2011).

3. Psychological well-being in aging.

Psychological well-being is highly influenced by exercise and physical activity through their moderating and mediating effects on constructs such as self-concept and self-esteem. It is vital to optimal aging, and it is dependent on a host of factors, including genetic traits, social support systems, personality types, and the presence of positive and negative psychological constructs such as happiness, optimism, morale, depression, anxiety, self-esteem, self-efficacy, and vigor. It is proved that regular exercise and physical activity is associated with significant improvements in overall psychological health and well-being. Both higher physical fitness and participation in AET are associated with a decreased risk for clinical depression or anxiety.

4. Effects of exercise on health

4.1 Exercise and life expectancy and mortality

A large and growing body of epidemiological data have studied and confirmed the benefits of physical activity on longevity. Recent meta-analyses would indicate that regular physical activity is associated with a 30% reduction in the risk of both all-cause and cardio vascular mortality in subjects free of cardio vascular disease (Nocon, 2008), with similar results observed in subjects with cardio vascular disease (Apullan, 2008; Taylor , 2004).

4.2 Exercise for Protective measures

The mortality benefits of exercise appear to be related to multiple cardio protective mechanisms, including effects on endothelial function, autonomic tone, inflammation and improved risk factor control (Juneau and Nigam , 2003). The final common pathways of risk reduction presumably operate through improved endothelial function leading to plaque passivation thereby reducing the risk of new or recurrent ischemic events, as well as effects on autonomic control of

cardiovascular function leading to a reduced risk of sudden cardiac death.

4.3 Effects exercise on cardio respiratory fitness

Aerobic fitness, objectively measured during cardiopulmonary exercise testing and expressed as maximal total body oxygen consumption or $VO_{2\,max}$, is one of the strongest predictors of all-cause mortality, CVD, health status and functional capacity in older people (Stathokostas et. al., 2004). $VO_{2\,max}$ declines during the aging process and a value of 15–18 ml/kg/min is generally required to maintain instrumental activities of daily living (Vogel et, at, 2009). $VO_{2\,max}$ in endurance-trained older subjects has been reported to be similar to VO2 max in sedentary young subjects (Wilson et.al, 2000), and regular exercise can partially counteract the 5–10% decrease of $VO_{2\,max}$ per decade (Mazzeo and Tanaka, 2001).

4.4 Effect of exercise of depression

Simple exercise is proved to be superior for the relief of depression (Blumenthal et al **,** 1999) directly in comparison to high-intensity aerobic exercise. Doyne et. al (1987) have addressed the issue of exercise modality, resistance training and found to be equivalent to aerobic training in young adults with depression as well as yoga was found to be as effective as aerobic exercise. A summary of the literature on exercise and depression suggests that it is effective in young and old, it is approximately as effective as antidepressants in clinical cohorts, that aerobic and resistance modalities seem equally beneficial, and that optimal responses are seen with higher intensities.

4.5 Effect of Physical activity and exercise on fitness.

Regular physical activity and exercise has unequivocally been shown to reduce the risk of cardiovascular disease, stroke, hypertension, type diabetes, osteoporosis, obesity, colon cancer, breast cancer, anxiety and depression (Nelson , 2007). The impact of physical activity on primary aging processes is difficult to study in humans because cellular aging processes and disease mechanisms are highly intertwined. There are currently no lifestyle interventions, including exercise, which have been shown to reliably extend maximal lifespan in humans. Rather, regular physical activity increases average life expectancy through its influence on chronic disease development (via reduction of secondary aging effects). It also limits the impact of secondary aging through restoration of functional capacity in previously sedentary older adults.

Exercise control the arterial blood pressure and vital organ perfusion, augmentation of oxygen and substrate delivery and utilization within active muscle, maintenance of arterial blood homeostasis, and dissipation of heat. The acute cardiovascular and neuromuscular adjustments to resistance exercise also seem to be well preserved in healthy older adults. Physiological aging alters some of the mechanisms and time course by which older men and women adapt to a given training stimulus and sex differences are emerging with respect to these mechanisms, but the body's adaptive capacity is reasonably well-preserved, at least through the seventh decade. During the combined demands of large muscle exercise and heat and/or cold stress, however, older individuals do exhibit a greater reduction in exercise tolerance and an increased risk of heat and cold illness/injury, respectively, compared with young adults. Age differences in exercise tolerance at higher ambient temperatures may be at least partially due to the lower aerobic fitness levels in older adults. Cessation of aerobic training by older adults leads to a rapid loss of cardiovascular and metabolic fitness, whereas strength training-induced (neural) adaptations seem more persistent, similar to what has been observed in younger populations.

5. Recommended exercise for successful aging

American College of Sports Medicine (ACSM) and the American Heart Association (AHA) published the first physical activity recommendations to improve and maintain health in older subjects (Nelson et.al, 2007). Institut National de la Santé et de la Recherche Médicale (INSERM) in the year 2008 also made similar recommendation. As per current guidelines, a minimum of 30 min of moderate-intensity aerobic exercise 5 days/week, or 20 min of vigorous intensity aerobic activity 3 days/week may keep the individual physically fit. Furthermore, muscle strength training should be performed ≥2 days/week, flexibility training ≥2 days/week for at least 10 min, in addition to balance exercises, particularly for individuals at high risk for falls. Importantly, although a minimum of 30 min of moderate-intensity activity on most days of the week is recommended, a recent very large observational study showed that even a smaller amount of leisure-time physical activity (15 min/day, 6 days/week) reduced total mortality, mortality from cardiovascular disease, and mortality from cancer (Wen et.al., 2011). These data should encourage many more individuals to incorporate a small amount of physical activity into their daily lives (Nigam and Juneau, 2011). Aerobic exercises that target cardio respiratory fitness may consist of walking, cycling or swimming, or any dynamic activity that requires a large muscle mass, that can be maintained continuously, and that stays within the aerobic range. A value of at least 10 000 steps/day is gaining popularity in the media and appears to be a reasonable estimate of daily activity for apparently healthy adults (Iwane, 2000) which roughly corresponds to a walking distance of seven kilometres. However, a significant proportion of elderly individuals are frail and possess co morbidities including cognitive impairment, malnutrition, functional limitations (e.g. arthritis) or poor psychosocial conditions, which make the aforementioned exercises difficult or impossible. In such cases, the primary aim of physical activity is to improve muscle strength, prevent/limit disability and maintain independent living through progressive endurance and resistance training, flexibility exercises and balance training. In debilitated patients, aerobic interval training may also be a useful adjunct to improve physical fitness. This training modality consists of exercise intervals interspersed by recovery (rest) intervals of similar or equal duration. Certainly, when safety is at all a concern with respect to a particular individual, a supervised training program is recommended. Furthermore, a thorough clinical evaluation and exercise stress test should be performed prior to commencing an exercise training program with activities individualized according to functional limitations and co-morbidities.

Conclusion

Exercise and physical activity may slower the aging process by controlling the physiological functions and preserving functional reserve in older adults. Various studies have shown that maintaining a minimal quantity and quality of exercise decreases the risk of cardiovascular mortality, prevents the development of some cancers, lowers the risk of osteoporosis and increases longevity. Aerobic and resistance exercises should include in daily routine in order to improve cardio respiratory fitness and muscle function, as well as exercises targeting flexibility and balance. Though the benefit seem to be directly linked to the notion of training volume and intensity, exercise prescription still needs to be clarified to enable the scientific community to develop even more precise recommendations, bearing in mind that the main aim is to foster long-term adherence to physical activity in this growing population.

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