Weight bearing exercises benefits and risks research paper example

Health & Medicine, Obesity

Introduction

Regular exercise is known to be a therapeutic lifestyle factor. It is not a drug, but it possesses many traits of a powerful pharmacologic agent. Routinely performing physical activity (PA) stimulates many beneficial physiologic changes in the body (O'Keefe, 2012). Age is associated with increases in body weight, body fat, and abdominal fat. Besides as age advances, many people tend to spend time in sedentary activities. Fifty-five to sixty years is the age when people retire from their services; and this sets a sedentary lifestyle for most. Sedentary lifestyle, as is widely known, is associated with obesity, diabetes, cancer, and/or cardiovascular diseases (CVD). Conversely, if such people are involved in regular PA, it is documented that it can be of great benefits and the weakening of the cardiovascular system can be certainly delayed, if not reversed, by adequate amounts of PA. Not only that, it also assists in maintaining bone mass in older individuals (Chomistek, 2012). PA can be either weight-bearing activities or non-weight bearing activities.

Weight-bearing activities or weight-bearing exercises are structured, force-generating activities that provide loading to the skeletal regions, above that provided by activities of daily living. Weight-bearing exercises can include running, aerobics, jogging, jumping, volleyball, and other sports that generate impact to the skeleton (MacKelvie, 2002).

For older adults, the American Heart Association (AHA) recommends that " To promote and maintain health, older adults need moderate-intensity aerobic PA for a minimum of 30 minutes on five days each week or vigorous intensity aerobic activity for a minimum of 20 minutes on three days each

week. (Nelson, 2007)” So, we understand that to reduce the adverse effects of leading a sedentary lifestyle, public health recommendations are that adults should be physically active. However, there is a considerable variability among different individuals with respect to one’s cardio fitness and cardio metabolic risk factor profile in response to regular exercise. Everyone has the knowledge that PA only benefits everyone, but several exercise interventional studies that have focused on exercise - induced changes in the body have raised a fundamental question - if there are individuals who have experienced one or several adverse responses (Bouchard, 2012)? We will see below the benefits and risks of performing weight-bearing exercises in older individuals.

Benefits

Routinely performing PA has been known and proven to be highly effective for prevention and treatment of many diseases (Bouchard, 2012). Osteoporosis is a global problem characterized by reduction in bone mass that can make one susceptible to bone fractures. Weight-bearing exercises is a strategy to increase peak bone mass. PA is considered to be the most important modifiable environmental factor to reduce the risk of falling in older populations. Older people have mobility problems that are often related to a combination of impairments in balance, gait, and lower-limb strength, which also are risk factors for falls and dependency in activities of daily living (ADL). A study by Littbrand (2006) evaluated the applicability of a high-intensity functional weight-bearing exercise program in older people who were dependent for their daily living activities. The study showed that a

high-intensity functional weight-bearing exercise program is applicable for use, regardless of cognitive function and shows benefits. Such weight-bearing exercise programs have been shown to have wide-ranging effects on physical function among the elderly population that are healthy as well as those with moderate impairments (Littbrand, 2006).

A study by O'Keefe et al found that that in sedentary individuals, even as little as 15 minutes per day of PA confers substantial health benefits, but these benefits are seen in a dose-dependent fashion up to about an hour per day of vigorous PA, beyond which more amount of exercises do not yield any further benefits. A 15-year long observational study on a large population of approximately 52, 000 adult participants found that runners had a 19% lower risk of all-cause mortality compared to those who were non-runners (Lee, 2012).

A recent review by Johansen and Painter assessed the rationale for exercise among patients with chronic kidney disease (CKD) not requiring dialysis and the effects of exercise training on the physical functioning, progression of kidney disease, and cardiovascular risk factors in older individuals. Exercise appeared to be safe in this patient population if begun at moderate intensity and increased gradually; it resulted in improved physical performance and functioning among these patients (Johansen, 2012). Similarly, a study by Ay and Yurtkuran assessed the effects of weight-bearing and aquatic exercises on the calcaneal ultrasonic scores of postmenopausal sedentary women. It showed that not only weight-bearing PA is superior to non-weight-bearing PA to increase the bone mass, but weight-bearing exercises can also increase calcaneal broadband ultrasound attenuation (BUA) (Ay, 2005). Similarly, a

study by Etherington et al confirmed that long-term weight-bearing exercise to be an important factor in the regulation of bone mass and fracture prevention (Etherington, 1996).

Another study by Mueller et al assessed the effects of weight-bearing exercise and non-weight-bearing exercises for diabetic individuals with peripheral neuropathy. The weight-bearing group showed greater gains over time on the 6 minute walking distance (6MWD) test and average daily step count (P <. 05) (Mueller, 2013). According to one review, several studies have shown improvements in bone density and structure, as well as in functional capacity and muscle strength in post -menopausal women. Observational studies focusing on PA and fracture risk reduction have shown that PA is associated with a reduced risk of fractures, especially hip fractures, both in men as well as in women (Nordstrom, 2011).

A review suggested that bone mass can be increased by some exercise programmes in adults and the elderly, and attenuate the losses in bone mass associated with aging. As per the review, cross-sectional studies show, in general, that exercise modalities requiring high forces and/or generating high impacts have the greatest osteogenic potential. Several training methods have been used to improve bone mineral density (BMD) and content in prospective studies. Some studies have shown limited positive effects of walking or running. Scientific evidence points to a combination of high-impact (i. e. jumping) and weight-lifting exercises for bone stimulation in adults. In the review, some studies have shown exercise involving high impacts, even a relatively small amount, appears to be the most efficient for enhancing bone mass, except in postmenopausal women. Studies performed

in older adults have shown only mild increases, maintenance or just attenuation of BMD losses in postmenopausal women, but net changes in BMD relative to control subjects who are losing bone mass are beneficial in decreasing fracture risk (Guadalupe-Grau, 2009).

Not only cardio – metabolic diseases or osteoporosis, weight-bearing exercises may also reduce cancer risk through effects on obesity and with changes to circulating levels of adipokines, cytokines, insulin, and sex hormones (Lee, 2006).

Risks

Though there are plenty of benefits of weight-bearing exercises on human health, it is not completely safe.

Long term excessive endurance exercises in the form of weight-bearing exercise may induce pathologic changes in the heart and large arteries of the heart. Literature suggests that chronic training for competitive activities like marathons or long-distance running cause a transient acute blood volume overload of the atrium and right ventricle of the heart, with transient reduction in right ventricular ejection fracture and elevation of cardiac biomarkers. All these return to normal within one week. However, if there is repetitive injury for months or years, in some individuals, this process may lead to patchy myocardial fibrosis particularly in the atrium, inter-ventricular septum, and the right ventricle. To add to this, long-term weight –bearing exercises can also induce coronary artery calcification, diastolic dysfunction, and large-artery wall stiffening (O’keefe, 2012 June).

Some literature suggests that there is a safe upper dose limit to the benefits

offered by exercise beyond which the adverse effects may outweigh its benefits. In one study, only running distances of about 1 to 20 miles per week or speeds of 6 to 7 miles per hour or frequencies of 2 to 5 days per week were associated with lower all-cause mortality, but higher mileages, faster paces, and more frequent runs were not associated with better survival rate (Lee, 2012). Another study showed that most adverse events in individuals older than 35 to 40 years are secondary to coronary artery disease (CA); but in younger individual they are linked to undetected congenital or inherited heart conditions. In both the cases, however, the adverse outcomes are related to physiologic stress of weight- bearing exercises in presence of a disease (Goodman, 2013).

A recent study showed that structural aortic stiffening with aging did not substantially improve in healthy old people, who have previously led a sedentary lifestyle, even after one year of progressive and vigorous endurance exercise training (Shibata, 2012). In another study by Littbrand, the adverse events associated with weight-bearing exercise were musculoskeletal such as pain or soreness, dizziness, breathlessness or discomfort in the chest, unspecified pain e. g., stomach pain, and psychological factor like fear of falling (Littbrand, 2006).

A complication of type 2 diabetes (T2D) is peripheral neuropathy, which means a loss of protective sensation of the feet. Therefore, significant peripheral neuropathy is an indication that weight - bearing exercise has to be limited as repetitive exercise on insensitive feet can lead to ulceration and fractures. Weight - bearing exercises are contraindicated in autonomic neuropathy as well because hypotension and hypertension after vigorous PA

are more likely to develop in these patients. This increases the risk of an adverse cardiovascular event during PA. High-resistance exercise using weights may be acceptable for young individuals with diabetes, but not for older individuals or those with long-standing diabetes (ADA, 2004).

Conclusion

In conclusion, many aging-related problems like cardiovascular diseases, obesity, diabetes, decrease in muscle mass, decrease in bone mineral density, some types of cancer, or decrease in fitness levels can be prevented in part by regular PA like weight-bearing activities like aerobics or running. Such exercises benefit the older population as well. Routinely performing regular PA has lot of benefits for both men and women above the age of 55 to 60 years; however, some amount of risk is also involved in the form of adverse effects. It is, therefore, necessary to identify individuals at risk of adverse effects of weight-bearing exercises so that proper guidance can be offered in a preventive or therapeutic context.

References

Ay, A., Yurtkuran, M. (2005). Influence of aquatic and weight-bearing exercises on quantitative ultrasound variables in postmenopausal women. American Journal of Physical & Medical Rehabiitationl, 84(1), 52-61.

Bouchard, C., Blair, S., Church, T., et al. (2012). Adverse Metabolic Response to Regular Exercise: Is It a Rare or Common Occurrence? PLoS ONE, 7(5), e37887.

Chomistek, A. K., Cook. N. R., Flint. A. J., Rimm. E. B. (2012). Vigorous-intensity leisure-time physical activity and risk of major chronic disease in

men. Medical Science Sports Exercise, 44 (10), 1898–1905

Etherington, J., Harris, P. A., Nandra, D., et al. (1996). The effect of weight-bearing exercise on bone mineral density: a study of female ex-elite athletes and the general population. Journal of Bone Mineral Research, 11(9), 1333-8.

Guadalupe-Grau, A., Fuentes, T., Guerra, B., Calbet, J. A. (2009). Exercise and bone mass in adults. Sports Medicine, 39(6), 439-68.

Goodman, J., Thomas, S., Burr, J. (2013). Cardiovascular risks of physical activity in apparently healthy individuals Risk evaluation for exercise clearance and prescription. Canadian Family Physician, 59, 46 – 49.

Johansen, K. L., Painter, P. (2012) Exercise in Individuals with CKD. American Journal of Kidney Disease, 59 (1), 126–134.

Lee, I. M, Oguma, Y. (2006). Physical Activity. In: Schottenfeld, D.; Fraumeni, JF., Jr, editors. Cancer Epidemiology and Prevention. New York, NY: Oxford University Press; p. 449-467.

Lee, J., Patte, R., Lavie, C. J., Blair, S. N. (2012). Running and all-cause mortality risk: is more better? Medical Science Sports Exercise, 44(6), 990–994.

Littbrand, H., Rosendahl, E., Lindelof, N., et al. (2006). A High-Intensity Functional Weight-Bearing Exercise Program for Older People Dependent in Activities of Daily Living and Living in Residential Care Facilities: Evaluation of the Applicability With Focus on Cognitive Function. Physical therapy, 86 (4), 489 – 498.

MacKelvie, K. J., Khan, K. M., McKay, H. A. (2002) Is there a critical period for bone response to weight-bearing exercise in children and adolescents? A systematic review. British Journal of Sports Medicine, 36, 250–7.

Mueller, M. J., Tuttle, L. J., Lemaster, J. W., Strube. M. J., et al. (2013). Weight-bearing versus nonweight-bearing exercise for persons with diabetes and peripheral neuropathy: a randomized controlled trial. Archives of Physical & Medical Rehabilitation, 94(5), 829-38.

Nelson, M. E., Rejeski, W. J., Blair, S. N., et al. (2007). Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. Circulation, 116, 1094–1105.

Nordstrom, A., Tervo, T., Hogstrom, M. (2011). The Effect of Physical Activity on Bone Accrual, Osteoporosis and Fracture Prevention. The Open Bone Journal, 3, 11-21.

O’Keefe, J. H., Patil HR, Lavie CJ et al. (2012, June) Potential Adverse Cardiovascular Effects From Excessive Endurance Exercise. Mayo Clinic Practice, 87(6), 587–595. Retrieved: http://www. ncbi. nlm. nih. gov/pmc/articles/PMC3538475/? report= classic

O'Keefe J. H., Patil H. R., Lavie C. J. (2012). Exercise and life expectancy. Lancet, 379 (9818), 799.

Position Statement. (2004). Physical Activity/Exercise and Diabetes. AMERICAN DIABETES ASSOCIATION. Diabetes care, 27 (1), S58 – S62. Retrieved: http://care. diabetesjournals. org/content/27/suppl_1/s58. full. pdf; Accessed: 26th Oct, 2013.

Shibata, S., Levine, B. (2012). Effect of exercise training on biologic vascular age in healthy seniors. American Journal of Physiology & Heart Circulation Physiology, 302 (6), H1340–H1346.