

## Physical activity: the non- pharmacological preventive remedy for non-communicable diseases (NCDs)

Islam MA

### Introduction

Physical activity (PA) defined as any voluntary bodily movement produced by skeletal muscles that requires energy expenditure.<sup>1</sup> PA encompasses all activities, at any intensity (figure 1), performed during any time of day or night.<sup>2</sup> Exercise and PA are frequently used interchangeably. Health-enhancing PA is activity that, when added to light-intensity activities of daily life, produces health benefits and involves the large muscle groups of the body and substantial energy expenditure. PA refers to health-enhancing physical activity. Exercise refers to the subset of PA that involves a structured program to improve physical fitness.<sup>1</sup> Regular PA improves health-related physical fitness-the physiologic components of fitness that influence risk for disease, functional limitations, disability, and premature mortality. These components include cardiorespiratory endurance (aerobic capacity); skeletal muscle strength, power, and endurance; body composition and bone strength; and balance, flexibility, and reaction time.<sup>3,4</sup>

The primary attributes of PA are type/mode, frequency, duration, and intensity. Types of PA (e.g., walking, swimming, lifting, stretching) are grouped according to their main physiologic effects into well-known categories: aerobic (or "cardio"), muscle strengthening, flexibility, and balance. Intensity is the level of effort during activity. For aerobic activity, the absolute intensity is measured in metabolic equivalents (METs), with 1 MET being the resting metabolic rate-an oxygen consumption of roughly 3.5 mL/kg/minute. Absolute intensity is commonly classified into: sedentary behavior (1.0 to 1.5 MET), light intensity (1.6 to 2.9 MET), moderate intensity (3.0 to 5.9 MET), and vigorous intensity (6.0 MET and higher). The relative intensity, which is the percentage of oxygen uptake (aerobic capacity) reserve required to perform an activity, ranges from 0 to 100%. In practice, the heart rate is used to

monitor relative intensity because of the generally linear relationship between heart rate and percentage of oxygen uptake.<sup>3</sup> The volume (or amount) of activity is the product of frequency, duration, and intensity. Volume can be measured as MET- minutes per week. A commonly used objective measure is the accelerometer which detects movement of the body and provides detailed information on the frequency, duration, and intensity of movement. PA has declined since the 1950s. Activity around home, activity as transportation for getting places and occupational activity has probably declined the most, but trends in recreational PA are either stable or slightly improving. Physical inactivity is a larger public health problem than previous. PA levels decline with age, and men report more activity than women. Higher income and education involves greater with PA.<sup>3</sup>

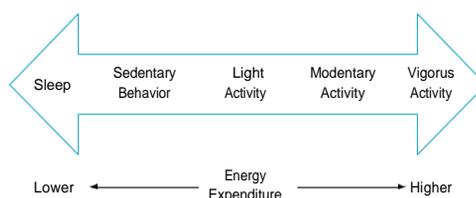


Figure 1: Intensity of PA on a continuum from sedentary behavior to vigorous PA<sup>5</sup>.

### Preventive and therapeutic health benefits and risk of PA in adults

Regular moderate PA like brisk walking, bicycling and vigorous PA like jogging, running, swimming, jumping rope, heavy gardening, hiking uphill reduces the risk for premature mortality and coronary artery disease (CAD), stroke, hypertension, dyslipidemia, type 2 diabetes mellitus (DM-

1. Prof. Dr. Mohammad Aminul Islam Professor, Department of Medicine Community Based Medical College, Mymensingh.  
Address of correspondence:  
Email: aminul1712@gmail.com  
Phone:01712-116214

T2), metabolic syndrome, osteoporosis, colon cancer, breast cancer, and obesity.<sup>4,6,7</sup> Even 15 minutes per day or 90 minutes per week of moderately intensive exercise is associated with a 14% decrease in mortality. PA can delay age-related functional limitations and loss of independence and reduces the risk for falls, cognitive impairment in older adults, age-related muscle loss, and depression, hip fracture, lung cancer, endometrial cancer, and sleep disorders, anxiety disorders, osteoarthritis, and back pain.<sup>3</sup>

The benefits of PA are independent of other risk factors, e.g., a sedentary obese smoker achieves health benefits from exercise, even if smoking and obesity persist. When a healthy diet, regular activity, and abstinence from smoking are considered simultaneously, the effect of lifestyle is even more dramatic. The main determinant of the health benefits of PA is volume. Substantial health benefits begin to occur with a volume of 500 to 1000 MET-minutes/week. An adult can accumulate 500 MET-minutes by walking at 3.0 miles per hour (a 3.3-MET activity) on 3 days a week for 50 minutes (3.3 METS x 3x 50 minutes ==500 MET-minutes). When measured by caloric expenditure, this volume of walking in a 75-kg (165-lb) adult expends an extra 430 kcal above the 190 kcal that would have been expended under resting conditions. The dose-response relationship between volume and health benefits is curvilinear.<sup>7</sup>

Guidelines assign therapeutic role to PA in patients with CAD, hypertension, DM-T2, obesity, osteoporosis, osteoarthritis, claudication, and chronic obstructive pulmonary disease. In individuals with impaired glucose tolerance and high cardiovascular risk, both baseline activity levels and changes in activity levels are associated with a reduction in subsequent cardiovascular events. PA also plays role in the management of depression and anxiety disorders, elevated cholesterol levels, pain, heart failure, syncope, stroke, back pain, dementia, and constipation and in the prophylaxis of venous thromboembolism.

More therapeutic benefits are getting from aerobic activity and muscle-strengthening exercise.<sup>8</sup> Exercise by sedentary older adults improves health-related physical fitness and has beneficial effects on functional limitations, such as a slow gait speed.<sup>4,8</sup> Physical activities, especially balance training, prevents falls in older adults at increased risk for falling, such as those with impaired gait and balance.<sup>9</sup> Exercise alone appears more effective than weight loss alone, and combined exercise and weight loss is most effective.<sup>10</sup> Musculoskeletal injuries are the commonest type of adverse event which depends on the type and volume of activity. Collision and contact sports have a much higher injury risk than noncontact activities such as walking.<sup>8</sup>

### Recommending PA in clinical settings

Promoting PA in clinical settings involves essentially the same steps as the "5 As" of smoking cessation: ask, advise, assess, assist, arrange-

1. Ask about the amount of PA per week.
2. Advise all patients to participate in at least a moderate amount of PA each week. Gradual tailoring of exercise is advised who do not meet the recommendations.
3. Assess the next step(s) to become more active.
4. Assist the patient in taking these steps.
5. Appointment to follow up.

### Exercise and lifestyle prescription

Exercise prescription includes type, frequency, duration, and intensity of aerobic exercise, exercise movements (e.g., bench press), repetitions, and sets for resistance exercise, exercises such as stretching, balance exercises, warm-up, and cool-down, risk Management strategies, such as increasing levels of activity gradually over time. A lifestyle prescription refers to approaches that integrate PA into daily life. Common ways to integrate PA into daily life are walking and biking for transportation and performing yard work and gardening.

## Key PA guidelines for adults

All adults should avoid inactivity. Some PA is better than none, and adults who participate in any amount of physical activity gain some health benefits. For substantial health benefits, adults should do at least 150 min (2.5 hour/week) of moderate-intensity aerobic activity or 75 min (1.25 hour/week) of vigorous-intensity aerobic activity, or an equivalent combination of moderate- and vigorous intensity aerobic activity. Aerobic activity should be performed in episode lasting at least 10 min and should be spread throughout the week. Community-level interventions that address such characteristics are essential to promoting physical activity for example school physical education, social support interventions, community-wide campaigns, enhancement of access to places where PA is possible, improving the connectivity of streets and the walkability of neighborhoods. Medical care and community efforts should be synergistic and mutually supportive. Health plans should be advocates for evidence-based community interventions.

### References:

1. *Global Recommendations on Physical Activity for Health, 2009.* World Health Organization. Geneva, Switzerland. Accessed 13/07/2018. Available at: <http://www.who.int/ncds/prevention/physical-activity/en/>
2. Pedišić Z. Measurement issues and poor adjustments for physical activity and sleep undermine sedentary behaviour research—the focus should be shifted, sedentary behaviour, standing and activity. *Kinesiology.* 2014; 46 (1), 135-146. Retrieved from <https://hrcak.srce.hr/123743>.
3. Marco Pahor, Jack M Guralnik et al Effect of structured physical activity on prevention of major mobility disability in older adults: the LIFE study randomized clinical trial. PMID:24866862. PMCID:PMC4266388.DOI:10.1001/jama.2014.5616.
4. Islam MA. Delay in ageing process. *Editorial. CBMJ.*2016; 05: 01: 1 - 3.
5. [https://en.wikipedia.org/w/index.php?title=physical\\_activity](https://en.wikipedia.org/w/index.php?title=physical_activity)
6. US Department of Health and Human Services. 2008. *Physical activity Guidelines for Americans.* <http://www.health.gov/paguidelines>.
7. William E. Kraus, M.D., Joseph A. Houmard, Ph.D., Brian D. Duscha, M.S Et Al. Effects of The Amount And Intensity Of Exercise On Plasma Lipoproteins. *NEJM* 2002;347:1483 - 1492.
8. Church TS, Blair SN, Cocroham S, et al. Effects of aerobic and resistance training on haemoglobin A1c levels in patients with type 2 diabetes: a randomized controlled trial. *JAMA*;2010;304:2253 - 2262.
9. Pahor M, Blair SN, Espeland M, et al. Effects of physical activity intervention on measures of physical performance: results of the lifestyle interventions and independence of fr elder pilots (Life-P) study. *J Gerontol A BiolSci Med Sci.* 2006; 61: 1157 - 1165.
10. Manson JE, Greenland P, LaCroix AZ, et al. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *NEJM* 2002; 347: 716 - 725.