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Physical Fitness through Physical Activity: A Foundation for Optimizing Physiological Health

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Abstract

Physical fitness is the bedrock of life and longevity. For this reason, it is a goal that everyone needs to strive for. This paper reviews how physical fitness is related to physiological health and wellbeing of an individual. The paper looked at different physical fitness factors related to general health and wellbeing. These factors were flexibility, muscular strength and endurance, percent body fat, and cardiorespiratory endurance. Several health conditions associated with poor fitness levels were examined such as cardiovascular disorders, metabolic syndrome, cancer and obesity. Following this, the role of physical fitness, a consequence of physical activity in improving physiological health and wellbeing was examined – it was revealed that a hundred and fifty minutes of physical activities weekly will yield good physiological health returns. Finally, circuit training was identified as a key exercise training approach for achieving all round physical fitness as it encompasses different exercise activities targeted at achieving an all-round fitness, an ultimate key to physiological health improvement.
Keyword: Physical fitness, Physiological health, Health improvement, Physical activities, Exercise

Introduction

Physical fitness is considered a fundamental requirement for life. A healthy and fulfilling life is linked to an individual's level of physical fitness. Physical fitness is the condition of an individual's body that allows him to perform his daily task effectively and efficiently without undue fatigue with enough energy reserve in place for any emergency. For over 7000 years, the importance of physical fitness as a precursor to physical health through daily exercise and physical activity has been recognized, dating back to ancient Chinese and Greek cultures (Berryman, 2010). Scientific data documenting the essentiality of physical activity for wellbeing started emerging since the late 1800s and early 1900s, where epidemiological studies clearly showed that physically inactive individuals were more likely than those who led active lifestyles to have coronary heart disease (Silverman & Deuster, 2014). The literature has been packed with evidence that physical inactivity plays an important role in raising the prevalence of obesity, cardiovascular disease (CVD), hypertension, type 2 diabetes, metabolic syndrome, insulin resistance, hyperlipidaemia, cancer of the breast and colon, as well as depression and anxiety (Galper, Trivedi, Barlow, Dunn, & Kampert., 2006; Blair, 2009; Goetzel, Pei, Tabrizi, Henke, Kowlessar, Nelson, & Metz., 2012; Kohl, Craig, Lambert, Inoue, Alkandari, Leetongin, & Kahlmeier., 2012; Pratt, Norris, Lobelo, Roux, & Wang., 2012; Wen & Wu, 2012). For a fact, physical inactivity is the fourth leading cause of death worldwide, (Kohl, *et al*. 2012).

Numerous non-communicable diseases that are linked to physical inactivity are stress-related; a stack contrast from living an active life, which is inversely connected to health conditions related to stress and the progression of chronic diseases and disorders (Deuster, Kim-Dorner, Remaley, & Poth., 2011; Deuster & Silverman, 2013; Huang, Webb, Zourdos, & Acevedo., 2013). Ogunleye (2017) outlined seven benefits of exercise that improve both physical fitness and physiological health as: increased lean muscle mass, which in turn increases the metabolic rate of the body, which is one of the means to a leaner body; increased bone mineral density, which can decrease osteoporosis; increased overall strength of the body, which can boost balance and decrease the risk of injury; improved overall mood and sense of well-being. Clearly, physical fitness is an important goal for anyone who places high premium on health, wellbeing and longevity. Hence the need to review in the contemporary setting, the role of physical fitness in physiological health improvement is discussed. First, different physical fitness components and their role in physiological health and wellbeing were identified, this was followed

by common health problems associated with physical inactivity, then, the role of exercise in remediating such problems as well as the place of circuit training in achieving a good exercise training programme.

General Fitness Components

These fitness components also known as health-related components of physical fitness, are fitness components that are considered necessary for everyone, including non-athletes as well as athletes. They are key to the prevention of chronic and non-communicable diseases and are needed for the completion of daily tasks and exercise activities. The health-related fitness components relates to exercise activities that a person engage in order to try to improve physical health and stay healthy, particularly in the categories of cardiovascular endurance, muscular strength, flexibility, muscular endurance and body composition, which are primary factors in health-related physical fitness components.. Health-related physical fitness components are primarily related to functional health and disease prevention. Participating in regular physical activity to enhance health-related fitness can help a person control weight, prevent diseases and illness, improve mood, boost energy, and promote better sleep.

Cardiorespiratory endurance reports of how well an individual's lungs, heart, and muscles work harmoniously to keep an individual's body active over a long period. People who exercise can enhance their cardiorespiratory endurance by engaging in a programme of consistent aerobic exercise. Improved cardiorespiratory fitness can provide abundant health benefits; and is tested by measuring how well the heart and lungs deliver oxygen to an individual's working muscles so that they can work hard during exercise (Frey & Fogoros, 2017). Elaine and Cronkleton (2017), states that increasing the cardiorespiratory endurance requires getting regular physical activity, and thus mentioned the following exercises for enhancing cardiorespiratory endurance; run and jump in place, jog in place, jumping jacks, standing side hops, side to side hops, in and out hopping squats; among other activities. Other activities to enhance cardiorespiratory endurance include: running or jogging, swimming, cycling, dancing, boxing, aerobics or similar activities, any active sport. Good cardiorespiratory endurance indicates that an individual's body can actually work at higher intensities for a longer period without fatigue. It is a quality for all who desire being functional members of any society or organization.

Muscular endurance is another essential factor in the health-related component of physical fitness. According to Brown (2018), the ability of a muscle to repeatedly exert force against resistance is known as muscular endurance. A form of muscular endurance is engaging in multiple repetitions of an exercise, much like running or swimming. Cespedes (2015) sees muscular endurance as the capability of a muscle to lift weight repeatedly over time. Muscular endurance differs significantly from muscular strength as muscular strength only measures the amount of force a person can apply in one repetition such as maximum weight, for example – a one-repetition bench press.

Muscular endurance and strength, according to Health Link (2016), are relevant for a number of reasons which include; increase an individual's ability to perform basic and advanced tasks such as opening doors, carrying boxes or tirelessly chopping woods; it also reduces a persons's risk of injury; helps people maintain a healthy body weight; it is associated with stronger and healthier muscles and bones; improve confidence and how an individual feels about his/herself; give an individual a sense of accomplishment; allow an individual to add new and different activities to his/her exercise program, among others. Muscular endurance is linked to an increased metabolism as physical tasks can be completed for longer period with reduced fatigue when exercising. Good posture; fewer injuries; less chance of back problems and better sporting performance are other fitness benefits from enhanced muscular endurance that promote physiological health.

American Council on Exercise (ACE) in Scott and Fogoros (2018) describes muscular strength as the maximal force a muscle group or muscle can exert during a contraction. Muscular strength is usually measured with a one-repetition maximum (1-RM) test. During a 1-RM, an exerciser performs one repetition of a single exercise to see how much weight he or she can lift. The quantity/amount of force a particular muscle can generate using a single maximal effort is referred to as Muscular Strength. The muscle strength of an individual is usually measured during muscular contractions. The capability of nerves to activate muscle fibres and the muscle fibre sizes are linked to muscle strength. In addition to understanding the definition of muscular strength, it's also imperative to know the benefits of strong muscles. Building muscle strength helps with body alignment, makes performing everyday actions easier, increases metabolism, and relieves stress (Scott & Fogoros, 2018).

Like cardiorespiratory fitness, muscular strength provides strong and independent prognostic information about the overall risk of illness and death in adults across a broad spectrum of ages (Gulati, Black, Shaw, Arnsdorf, Merz, & Lauer, 2005; Sui, LaMonte, Laditka, Hardin, Chase, & Hooker, 2007). This applies to apparently healthy people and to those with diabetes mellitus, hypertension, metabolic syndrome, and several types of cancer (LaMonte & Blair, 2006).The best way to develop muscular strength is to participate in a program on resistance training, commonly called strength training or "weightlifting."

Flexibility also known as limberness is referred to as the range in which a particular joint or series of joints move, and the entire length in muscles which run across the joints in order to bring about a bending motion or movement. It is possible to increase the flexibility of some joints to a certain extent through exercise, using stretching as a common component of the exercise programme to help improve or maintain flexibility. Maintaining and improving an excellent range of motion in the joints can help to enhance quality of life. Low joint flexibility could serve as a predisposing factor for physical issues like balance disorders or pain syndromes. The flexibility level of an individual's body is calculated and measured by carrying out a sit and reach test, in which the result is described as the personal flexibility score (Dilmen, 2009).

In physical fitness, body composition is very important. A good indicator of body composition is percent body fat which usually refers to the percentage of fat contained in the human body. Fat tissues take up more space in our body than muscular tissue, because of this, our percent body fat, and also our body weight, determines a person's leanness. Two individuals of the same body weight and gender may appear totally different from each other due to the fact that they possess different percent body fat. A healthy balance between fat and muscle is vital for health and wellness throughout life. Scientific evidence show that a healthy percent body fat increases lifespan; lowers the danger of having heart disease, cancer, diabetes, insulin resistance, increases energy levels, and improves self-esteem (InBody USA, 2017).

Common Health Problems Associated with Poor Fitness Levels

There are many health conditions that are associated with poor fitness levels or physical inactivity. These conditions are called hypokinetic diseases. They form a majority of the preventable causes of death in modern era. Common categories of these conditions are presented thus:

Cardiovascular diseases

Cardiovascular disease (CVD) is a category of diseases in which the heart and/or blood vessels are involved. These conditions minimize the physiological efficiency of the heart, blood vessels and the blood. Coronary artery diseases (CAD) such as angina and myocardial infarction (commonly called a heart attack) are classified in CVD (Mendis, Puska, & Norrving., 2011). Stroke, cardiac failure, hypertensive heart disease, rheumatoid heart disease, cardiomyopathy, irregular heart rhythms, congenital heart disease, valvular heart disease, carditis, peripheral artery disease, thromboembolic disease, aortic aneurysms, and venous thrombosis are other CVDs (Naghavi, Wang, Lozano, Davis, Liang, and Zhou, 2015). These disorders are mainly associated with lack of exercise or physical activity and other associated morbidities, such as obesity, high blood cholesterol, among others. It is estimated that high blood pressure accounts for around 13 percent of CVD deaths, while cigarettes accounts for 9 percent, diabetes 6 percent, absence of exercise 6 percent and obesity 5 percent (Mendis *et al*., 2011).

Cancer

Cancer is a group of diseases with the ability to invade or spread to other parts of the body involving irregular cell growth. This are in contrast to benign tumours that do not propagate. The use of tobacco is the cause of about 22 percent of deaths from cancer. Up to 30–35% of cancer deaths are associated with physical inactivity and obesity (Anand, Kunnumakkara, Sundaram, Harikumar, Tharakan, Lai, *et al.*, 2008). Studies indicate that the progression of many cancer types is associated with excess body weight and is a factor in 14-20 percent of cancer deaths. In addition, a higher body mass index is correlated with at least 10 cancer forms and is responsible for about 12,000 cases per year in the United States, for example (Bhaskaran, Douglas, Forbes, dos-Santos-Silva, Leon, & Smeeth., 2014). Physical inactivity, not just through its impact on body weight, but also through adverse effects on the immune system and endocrine system, is believed to lead to cancer danger (Kushi, Byers, Doyle, Bandera, McCullough, McTiernan, Gansler et al., 2006).

Metabolic syndrome

Metabolic syndrome (MetS) is a group of co-occurring disorders that raise the risk of heart disease, stroke, and type 2 diabetes. Increased blood pressure, elevated blood sugar, excess body fat around the hips, and excessive levels of cholesterol or triglycerides are all disorders. Metabolic syndrome is closely associated with being overweight or obese or inactive (Mayo Clinic, 2019). The metabolic syndrome (MetS) is a major and escalating public-health and clinical challenge worldwide. It is a major consequence of urbanization, surplus energy intake, increasing obesity, and sedentary life habits. MetS has made a 5-fold increase in the risk of type 2 diabetes mellitus (T2DM) and 2-fold the risk of developing cardiovascular disease (CVD) (Kaur, 2014).

Obesity

Obesity is a medical disorder that has accumulated excess body fat to the point that it can have a detrimental health effect (World Health Organization, 2015). Individuals are commonly considered obese when their body mass index (BMI), a calculation obtained by dividing the weight of a person by the square of the height of the person, is over 30kg/m^2; the range is characterized as overweight by 25-30kg/m^2. A sedentary way of life plays an important role in obesity. There has been a major change worldwide to less physically demanding jobs, and at least 30 percent of the world's population is actually not getting enough exercise (Ness-Abramof & Apovian, 2006). This is mainly due to the rising use of mechanized transport and a higher prevalence of home labour-saving technology. In children, due to less walking and physical education, there appears to be reductions in physical activity levels (Salmon & Timperio, 2007).

Physical Fitness and Health

Physical fitness is a product of physical activity. The rewards of physical activity (PA) and exercise are irrefutable; anyone can benefit from becoming more physically active (or fit). Regular physical activity is in effect a preliminary and secondary preventative measure for more than twenty five (25) medical conditions that are chronic in nature (including cardiovascular diseases) and premature mortality (Warburton *et al.*, 2006; Pedersen & Saltin, 2015). As acknowledged by the World Health Organization (2010), exercise is the 4th front-end risk factor for mortality reduction worldwide and accounts for approximately 3.2 million deaths annually.

Most international bodies (such as World Health Organization, WHO and American College of Sports Medicine, ACSM) have provided guidelines for physical activities based on overwhelming body of evidence supporting it the benefits of regular physical exercise, (Warburton, Charlesworth, Ivey, Nettlefold & Bredin, 2010). Most international guidelines have come to a consensus and recommend at least 150 minutes of moderate to vigorous physical activity weekly (MVPA). Also noteworthy is that exercise (a behaviour) and general physical fitness (an attained or acquired condition) are inversely related to all causes of mortality and chronic diseases. However, health-related physical fitness or general fitness is constantly associated with more risk reductions (Warburton *et al.*, 2007).

The health benefits of physical activity (PA) can be achieved at even significantly low volumes of physical activities (e.g. even less than half of current recommendations) in seemingly healthy individuals and also in people living with chronic health conditions (Myers *et al.*, 2004; Lee & Skerrett, 2001; Wisloff *et al.*, 2006). Wen and Colleagues (2011) reported that 15 minutes per day (or 90 minutes per week) of moderate intensity PA significantly reduced the risk for deaths related to all cancers, cardiovascular disease, diabetes, and all causes. Importantly, 15 minutes per day of PA conferred a risk reduction of approximately 14% for all-cause mortality. Every additional 15 minutes of daily PA (up to a maximum of 100 minutes a day) provided an additional risk reduction of 4% for all-cause and 1% for all-cancer-related mortality (Wen *et al.*, 2011). The largest health benefits were seen from the first 1-2 hours of PA. Similarly, Lee and colleagues (2014) reported recently that weekly running of about 51 minutes covering about 6 miles, 1 to 2 times per week, decreased the risk for premature mortality. The authors emphasized that running at slow speeds for only 5-10 minutes per day can lead to marked health benefits. This is what every average healthy person can do. No complicated equipment is needed to engage in running. Also, running does not require any super skill or experience. Arem, Moore and Patel, (2015) recently revealed that engaging in any level of PA was associated with a lower risk of mortality (20%). Engaging in recommended levels of activity was associated with a mortality benefit (i.e., 31%) that was closer to the optimal benefit with a threshold occurring at approximately 3-5 times the PA recommendation (i.e., 39% risk reduction). This group also showed that engaging in ≤ 50% of the recommended minimum [equivalent to up to 75 minutes of brisk walking per week] resulted in approximately 2 years of life gained (Moore, Patel & Matthews, 2012).

Moreover, there is clear evidence that musculoskeletal fitness is associated directly with health status (Warburton, Nicol & Bredin, 2006). In fact, many activities of daily living require a requisite level of musculoskeletal fitness without a significant aerobic output. The level of evidence supporting the health benefits of musculoskeletal fitness is extremely strong. Musculoskeletal fitness has been associated positively with Percent body fat, functional status, glucose homeostasis, mobility, bone health, overall quality of life and psychological well-being, as well as negatively associated with morbidity, premature mortality and risk of falls (Mason, Brien, Craig, Gauvin, & Katzmarzyk., 2007; Payne, Gledhill, Katzmarzyk, Jamnik, & Ferguson, 2000). A "paradigm shift" in exercise science and medicine has occurred wherein experts have increasingly advocated the importance of engaging in activities/exercises that task the musculoskeletal system (Warburton, Gledhill, & Jamnik., 2011). This includes providing detailed and individualized musculoskeletal exercise prescriptions for persons living with chronic medical conditions (Giacomantonio, Bredin, Foulds, & Warburton, 2013; Bredin, Warburton, & Lang., 2013). Importantly, significant changes in clinical status can occur with relatively small positive changes in

physical activity. Risk reductions of 15%-30% for premature mortality and chronic medical conditions are not uncommon which is of great clinical importance (Lollgen, Bockenhoff, & Knapp, 2009).

Circuit Training in Physiological Health Improvement

Circuit training is a form of body conditioning or endurance training or resistance training using high-intensity. It targets strength building or muscular endurance. An exercise "circuit" is when a subject is able to complete all prescribed exercises in the circuit training session. On the completion of a circuit, the subject begins the first exercise again for the next circuit. Most often, the period between activities in a circuit training session is brief, since circuit training usually involves rapid movement and progression to the next exercise (Tom, 2018).

Mackenzie (2018) recommends that circuit should work each section of the body individually, he further states that typical activities include: Upper-body: Squat ups, Bench dips, Back extensions, Medicine ball chest pass, Bench lift, Inclined press up; Core and trunk: Sit ups (lower abdominal), Stomach crunch (upper abdominal), Back extension chest raise; Lower-body: Squat jumps, Compass jumps, Astride jumps, Step ups, Shuttle runs, Hopping shuttles, Bench squat; Total-body: Burpees, Treadmills, Squat thrusts, Skipping, Jogging.

From a health point of view, research indicates that the amount of intensity elicited different oxygen consumption values (39 percent to 51.5 percent of VO2max) in performing circuit exercises that comply with existing guidelines of the American College of Sports Medicine (ACSM) for the prescribed intensity (40 to 85 percent of VO2maxR) of exercise for the production and maintenance of cardio-respiratory fitness. This circuit therefore offers not only an important stimulus for muscle strength, but also helps comply with cardiovascular fitness guidelines from the American College of Sports Medicine (ACSM) and a revised 2005 Dietary Advice for Americans on physical fitness (Len, 1996).The gains from circuit training is general because it accommodates activities for various body segments in one session of the programme.

Conclusion

This review detailed on the relationship between physiological health improvement and physical fitness acquired from regular participation in exercise. With physical fitness considered a fundamental requirement for life and an essential ingredient of longevity and improved health and wellbeing, it is only worthwhile that individuals work towards becoming more and more physically fit. Generally, majority of the population will benefit health-wise by pursuing general fitness/health-related fitness goals, which are fitness goals related to disease prevention and health promotion, these include cardiorespiratory endurance, muscular strength and endurance, flexibility and percent body fat. Poor fitness levels is associated with adverse health outcomes as well as the development of most life-threatening non-communicable diseases including a broad range of cardiovascular diseases, cancer, obesity and metabolic syndrome. For this reason, the role of physical fitness achieved through moderate levels of physical activities is indispensable to people's health and wellbeing. On this premise the following recommendations are made:

- Individuals should spend hundred and fifty (150) minutes of moderate to vigorous physical activities for good fitness gains.
- In order to achieve full fitness potentials, a circuit training exercise session is considered fitting as it bundles in exercise training programmes that are designed to reach all fitness components into one single programme.
- Individuals are here hereby advised to seize every opportunity to be physically active such as using rest periods in between work to achieve some levels of physical activities no matter how small as these efforts could accumulate into worthwhile fitness gains.

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