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Chapter

Physical Activity and Health Promotion: A Public Health Imperative

Ina Shaw, Musa L. Mathunjwa and Brandon S. Shaw

Abstract

Continuing epidemiological and clinical studies have accumulated evidence that appropriate regular physical activity (PA) results in significant health benefits and can even prevent and treat many diseases like cardiovascular diseases, obesity, diabetes, musculoskeletal problems, stress, anxiety, and depression. These benefits are universal to all populations and age groups making physical activity a critical component in reducing many of the leading causes of global mortality. Additional benefits have also been found to follow an expanding quantity and quality of PA through the proper manipulation of the exercise design (i.e., frequency, intensity, duration, and mode). Global health benefits are achievable through physical activity, but this requires competent health professionals able to prescribe appropriate physical activity to their clients, patients, and communities to ensure engagement in increasing their PA levels and thus contribute to their own well-being and the prevention of the main non-communicable chronic diseases (NCDs).

Keywords: epidemiology, exercise, disease prevention, intervention, measurement, surveillance, wellbeing, wellness

1. Introduction

Physical activity can be described as any deliberate bodily movement generated by the skeletal muscles requiring bioenergetics [1]. Physical activity can encompass all activities, at any intensity and includes both exercise and incidental (i.e., not planned, structured, repetitive, or purposeful) activity integrated into daily routine [2]. However, global physical activity guidelines and recommendations exist based on the amount of exercise required to reap the health benefits of physical activity. One such guideline advises that individuals aged 18 years and older should accumulate 150 minutes of moderate-intensity activity per week, or equivalent [3].

Regular physical activity involvement has been linked with a significant decrease in the risk for premature mortality. It has similarly been found to decrease the risks of more than 25 chronic conditions [4, 5]. Specifically, research has demonstrated substantial evidence that regular physical activity is related to a reduced risk for all-cause mortality and numerous chronic conditions such as cardiovascular disease, ischemic

heart disease, and ischemic stroke, type 2 diabetes, gestational diabetes, hypertension, breast cancer, colon cancer and gallstone disease [6]. Problematically, this guideline is overly simplistic because certain physical activity modalities have been demonstrated to promote health, contribute to disease prevention and rehabilitation in different ways and through different mechanisms.

In this regard, aerobic physical activity modalities have unequivocally been found to have significant cardiorespiratory benefits and reduce the incidence of and mortality from cardiovascular and metabolic diseases from multiple mechanisms including inter alia, anti-ischemic, anti-atherosclerotic, anti-thrombotic, and anti-arrhythmic, effects in addition to its psychological health benefits encompassing reductions in anxiety, depression, and stress [7]. In turn, resistance activities have been found to exert its own plethora of health-promoting and disease prevention benefits such as reducing low back pain, arthritic discomfort, while promoting functional independence and status, and mobility [8, 9]. Resistance activities have also been demonstrated to be the most superior exercise modality to increase metabolic rate, lean body mass and bone mineral density [9]. It is for this reason that resistance activities are now endorsed for inclusion into an all-inclusive physical activity programme by various global health organisations, including the American College of Sports Medicine, American Heart Association, and the American Association of Cardiovascular and Cardiopulmonary Rehabilitation and Surgeon General's Office [10]. As such, any physical activity programme aimed at improving health and preventing disease should focus on including regular aerobic and muscular fitness activities, as well as reducing time sedentary behaviour.

1.1 The pandemic of physical inactivity

Globally, one in four adults (25%) do not meet these globally recommended levels of physical activity. This figure is even more alarming in the global adolescent population where more than 80% of adolescents have been found to be insufficiently physically active [3]. In the United Kingdom (UK), physical inactivity is linked to one in six deaths and costs the UK £7.4 billion annually. Unfortunately, the UK population is proposed to be approximately 20% less active than in the 1960s with projections that the population will be 35% less active by 2030 [11].

2. Consequences of physical inactivity

A lack of sufficient daily physical activity is an underappreciated primary cause of most chronic conditions with vast evidence demonstrating that physical inactivity results in a plethora of both physical and mental ill health conditions. Such physical health conditions include obesity, diabetes, certain types of cancer, and cardiovascular diseases [6, 12]. Some of the mental ill health conditions include declines in memory, and increases in anxiety, and depression [13].

3. Benefits of physical activity

Overwhelming scientific data has accumulated that demonstrates the significant health benefits linked to regular physical activity [11]. Participants of regular physical activity experience a multitude of physical, psychological, and social benefits.

Physiologically, regular physical activity can improve all systems of the body leading to inter alia improved cardiorespiratory fitness, muscular fitness (including muscular strength and endurance), body composition, flexibility, and balance [14, 15]. Physical activity has even demonstrated to have a positive influence on dietary behaviour [16]. However, health is determined by both the lack of disease and an individual's resistance to pathogenic factors [17]. In this area, physical activity has demonstrated its effectiveness at reducing an individual's risk of developing numerous chronic conditions and diseases [6]. In fact, individuals who engage in insufficient physical activity have a 20–30% increased risk of death compared to individuals who are sufficiently active [3].

Research has also indicated the positive impact on several areas of an individual's psychology. In this regard, studies have been found to demonstrate that physical activity has confirmed beneficial effects on sleep [18], independent function [19], overall mood [18], cognition [20], self-esteem [21], stress [22], and depression [23]. While regular physical activity has demonstrated these effects in both clinical and non-clinical settings, a greater magnitude of improvements has been demonstrated in a clinical environment in those patients with manifest mental illness [24]. It is for this reason that physical activity has a significant role in the management of mental health conditions, such as depression and anxiety [24]. However, it must be noted that studies have shown that in addition to its beneficial effects, excessive physical activity may lead to overtraining and impair mental health specifically generating psychological symptoms that mimic depression [24].

3.1 Mechanism of effect of physical activity and physical health

The improvement of health and prevention of disease depends on the mechanisms of general adaptation and enhanced homeostatic regulation and [25]. In this regard, there are several changes which are essential both for increasing adaptivity and for increased human performance [26]. Such changes that improve health and prevent disease include improvements in immunoactivities such as central nervous regulation and function, increased endocrine system function, higher insulin sensitivity, improvement in the capacity of the oxygen transport system, improvements in oxygen intake, delivery, and usage, increases in metabolic function, increased energy potential, and increases in functional stability [25, 26]. Further, physical activity has direct positive influences on the cardiovascular system including lower systemic blood pressure, increased availability of vasodilatory mediators such as nitric oxide, enhanced myocardial contractility, improved lipoprotein metabolism, enhanced ageing-related calcium distribution leading to an enhanced antisclerotic effect of physical activity, improved diaphragm and respiratory muscle strength increasing air flow through the lungs, reduction of respiratory mucous, and an increase oxygen levels [27–29].

3.2 Mechanism of effect of physical activity and mental health

Mental disorders are a major public health concern. There are numerous hypotheses proposing the mechanism of the effect of physical activity on mental health [24]. Despite the limited research on the mechanistic effects of physical activity on mental health it is thought that improvements in mental health arise from a combination of both psychological and physiological mechanisms, comprising endorphins, neurotransmitters, and the hypothalamic-pituitary-adrenal axis, and via the thermogenic hypothesis [30].

A possible psychological mechanism by which physical activity may improve mental health is related to the distraction hypothesis. Distraction is proposed to move individuals away and distract them from stressful stimuli and into physical activity [31]. Further, many individuals find physical activity to be psychologically and physically challenging. By overcoming such challenges through it is proposed that an individual's self-efficacy improves, leading to an improved self-confidence and mood [31].

Physiologically, the most well-known mechanism by which physical activity affects mental health is through endorphins, which are endogenous opioids. Specifically, physical activity has been demonstrated to positively impact mental well-being, mood, and common mental disorders and their symptoms through the enhanced release of beta endorphins [31]. It is also thought that physical activity affects mental health through brain monoamines, such as dopamine, norepinephrine, and serotonin, which are the three foremost monoamine neurotransmitters demonstrated to be impacted upon by physical activity [32]. However, different physical activity, and specifically the intensities at which they are performed, may cause varied amounts of feedback in the hypothalamus-pituitary gland-adrenal gland axis and should be taken into consideration when developing physical activity public health interventions for mental health [32]. Another proposed physiological mechanism by which physical activity may positively influence mood is through thermogenesis or the production of the body because of an increased energy production required for the physical activity. It is this thermogenesis, that like a warm bath, is proposed to result in relaxation and a better mood [31].

4. Barriers to physical activity

Thanks to sustained global and national efforts, it is increasingly rare that individuals do not know that physical activity has demonstrable benefits for both physical and mental health. However, despite knowing the multitude of benefits associated with regular physical activity, many individuals still experience barriers preventing them from engaging in physical activity. Barriers can be recognised as either physical, psychological, or socio-ecological.

Identifying the barriers and motivators contribute toward the development of specific physical activity health promotion interventions [33]. Recent studies have suggested that barriers prohibiting engagement in physical activity in adults relate mainly to environmental factors and resources, while motivators facilitating engagement in physical activity relate to health benefits, social influences, reinforcement, and assistance in managing change [33].

As such, physical activity public health interventions should focus on overcoming deficiencies in environmental factors and resources. This could be achieved by for example presenting physical activities in the community, effectively reducing environmental factors, such as the extreme cold weather conditions and limiting street environment indicators [34]. Further, physical activity public health interventions could mitigate the effect of resources by making use of existing resources in the community (i.e., community centers for delivery of interventions) and design appropriate physical activity interventions for use in these facilities based on their low supervisory requirements and cost implications [35]. To ensure the effectiveness of the community- and population wide interventions based on motivating factors, physical activity interventions could promote and objectively monitor the health benefits

associated with the physical activity intervention. With regards to social influences and reinforcement, physical activity interventions should make use of activities such as group, rather than individual, interventions.

5. Physical activity as a public health intervention

Public health covers both illness prevention and promotion of personal wellbeing. Today's public health requires an inter- and multi-disciplinary team of public health workers that can implement a variety of preventive and/or responsive interventions, including epidemiology, outreach, screening, health teaching, social marketing, and policy development. Due to physical activities ability to contribute to numerous spheres of public health, it has become an integral component of public health systems [36, 37].

Research in the physical activity adherence has resulted in the recognition of several methods to influence an uptake of physical activity at the individual level [38]. However, the considerable prevalence of inactivity across most sectors of the global population necessitates higher-level approaches to physical activity promotion that include environmental, organisational, and policy-level strategies.

Physical activity provides an ideal population-wide public health intervention due to its efficacy and its low-cost ideally suited to the limited resource environment public health decision makers frequently find themselves in [39]. In this regard, many physical activity interventions require little/no equipment, require minimal supervision (in those without high risk), and can be delivered in community settings. Further, many health professionals such as physiotherapists, Biokineticists, and exercise physiologists are already serving in communities and at a population level in many countries, including low- and middle-income countries (LMICs) [40]. Where communities and countries exist that do not have such professionals specifically trained in physical activity, there is opportunity for roles and training for physical activity awareness and prescription to be offered to other healthcare professionals, such as public health practitioners, and nurses, already well placed in communities, at schools, and at a population level.

It is important to understand how physical activity affects the whole ecology. In this regard, physical inactivity and its associated morbidity and mortality affects the home, school, and workplace. It is this pervasive importance that should ensure that physical activity considerations be utilised in local strategy, policy and planning and enhancements to the built or natural physical environment to improve public spaces, workplaces, and schools to boost and provide individuals of all sectors, ages, and abilities access to physical activity.

Physical activity is imperative at a local community level due to its significant impact on physical and mental wellbeing. Determining methods for individuals in communities to enjoy physical activity can encourage regular physical activity participation. This can be achieved by prioritising pedestrians, cyclists and individuals who utilise public transport, involving community members in creating and managing public spaces [41].

Limited evidence exists to demonstrate the most appropriate methods to enhance physical activity in young children, especially considering declining school participation in sports and removal of physical education programmes [42]. However, the inclusion of parents in public health initiatives to perform parental goal setting with their children regarding physical activity have been found to be successful. Further,

parental monitoring, having physical activity training providers, and encouraging healthy role-modelling in schools could increase children's levels of physical activity and could lead to healthier familial and school environments. This increase in physical activity is especially important in that being active in childhood has unequivocally been shown to encourage physical activity participation into adulthood [41].

The workplace presents an ideal setting to promote and deliver physical activity initiatives. This is because physical activity in the workplace provides the opportunity to overcome one of the most common barriers to regular physical activity namely a 'lack of time'. Workplace physical activity programmes also provide access to physical activity to a large portion of society [43]. Apart from the long-term physical and mental health benefits associated with physical activity, when physical activity is promoted in the workplace it has been shown to decrease conditions that contribute to absenteeism associated with illness, improve productivity and staff retention, decrease the costs for employers, and increase loyalty [41].

6. The way forward in addressing the pandemic of physical inactivity

Although physical activity guidelines have evolved considerably over the last few decades, due to ever-increasing physical inactivity, many public health organisations have attempted to develop physical activity intervention programmes that are more palatable to the sedentary and have recommended the accrual of 30 minutes of only moderate-intensity exercise performed on the majority of days of the week. Problematically, an adverse result of such guidelines is that some individuals and healthcare professionals believe that vigorous physical activity is not required for optimal health or the prevention and management of disease.

Since increasing benefits occur with concomitant increasing quantity and quality of physical activity, it is essential to consider the application of one or more of this vast number of physical activity modalities and their unique design elements to ensure optimal health promotion and disease prevention [11]. Establishing the most suitable combination of these elements is key to the success of an exercise programme in terms of health promotion, disease prevention and rehabilitation. Further, both the setting (i.e., school or workplace) and population (i.e., children or elderly community-dwelling adults) additionally complicates the determination of the elements [44].

Although, physical activity prescription has become an important public health issue, at an individual, practice or organisational level, there tends to be a focus on a single type of physical activity to improve health, and prevent or manage disease [37]. This is despite overwhelming evidence demonstrating that it is essential to undertake physical activity that promotes cardiorespiratory fitness, muscular fitness (including muscular strength and endurance), body composition, flexibility, and balance, not just one of these [37]. In general, the ACSM recommends that healthy adults perform aerobic training at 60–80% heart rate maximum, for 30–60 minutes a session, 3–5 days a week and resistance training be performed at 60–80% one-repetition maximum, using eight to 10 large muscle exercises, for eight to 12 repetitions and two to three sets, 2–3 days a week. According to the ACSM, to ensure optimal health and disease prevention, flexibility training should also be performed for 10–15 minutes twice a week and neuromotor training two to three times a week [45].

However, it is essential to note that this prescription may be considered overly simplified since programme design is additionally complicated by the level of fitness

at the onset of the programme (i.e., beginner, intermediate or established). Further, when replicating and adapting physical activity programmes in a variety of public health settings, it is essential to consider the specific elements within an exercise programme design. When considering aerobic activities, modality (e.g., walking, running, swimming, cycling, and jumping), frequency, duration, and intensity need to be taken into consideration, while volume, intensity, tempo, rest intervals, and frequency need to be considered in resistance activities and whether muscle strength, muscle endurance, power and/or hypertrophy are the outcomes. The incorporation of flexibility activities into home, school and workplace physical activity programmes can lead to an enhanced overall health and well-being. However, the modality (e.g., static, or dynamic), stretch duration, and intensity all need to be considered. It is due to this sheer diversity of variables affecting physical activity public health programme interventions that an increased focus on training physical activity public health specialists or the development of guidelines and policies related to a formal referral scheme to qualified exercise specialists once established disease and multiple manifest risk factor for disease are present to appropriately manipulate the programme design elements to attain positive outcomes.

In this regard, although there is a need to build community- and population-wide capacity based on existing literature, there is a need to move away from a solely a behavioural science approach focusing on individuals, and rather to a systems approach that focuses on populations and the complex interactions among the correlates of physical inactivity [39, 40]. This is because the role of a variety of health professionals in prescribing appropriate physical activity or referrals to their clients, patients, children, and employees is vital to increasing global physical activity levels, which in turn, would enhance physical and mental health and well-being, and the prevention and management of key non-communicable diseases (NCDs).

The development, identification, and monitoring of approaches to promoting physical activity as a public health imperative in communities, schools, and workplaces, and at a population level need to be explored [46]. However, such approaches and recommendations need to be based on the principles of inclusive and engaged partnerships between various stakeholders such as members of community, investigators, healthcare professionals, and policy makers. More research is needed to identify factors influencing who receives physical activity interventions and how interventions are selected for communities and populations [47, 48]. Further, there is an increased need for all health professional, not just physiotherapists, Biokineticists, and exercise physiologists to (1) understand specific activities and interventions that they can incorporate as part of routine care that can prevent physical inactivity, (2) think about the resources and services available in their communities that can assist the community to become active, (3) how to measure their impact and value of their own contribution, and (4) understand and make use of physical activity referral schemes to suitably qualified health care professionals.

7. Conclusions

Physical inactivity is a major global issue. The benefits of regular physical activity as a public health intervention require health professionals to become aware and competent in prescribing it to promote wellbeing and prevent ill health as part of their everyday practice. Due to the increasing global incidence of NCDs and its scientific efficacy, physical activity has increasingly been included into public health initiatives.

However, there remains significant deficiencies policies, practice, and engagement as evidenced by the ever-increasing prevalence of physical inactivity. Thus, it is recommended that more emphasis be placed on the importance of physical activity on both our physical and mental health from a young age into advanced age, while considering specific and vulnerable populations to ensure equality. Political will is required to encourage health professionals and government alike to include physical activity into the fabric of public health, including schools, communities, and workplaces. This is because the prescription of physical activity by a variety of health professionals is critical to improve health, and prevent and manage chronic disease considering their trusted relationships with patients, families, and communities. Future work is needed related to the scalability of community- and population-wide physical activity intervention programmes.

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Conflict of interest

The authors declare no conflict of interest.

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