TECHNOLOGICAL ADVANCEMENT, PHYSICAL ACTIVITIES AND SEDENTARY LIFE BEHAVIORS: CHALLENGES AND THE WAY FORWARD

DAHIRU ABDULLAHI DANASABE (PhD).
Department of Human Kinetics and Health Education
Ibrahim Babangida University Lapai, Niger State
Email: danasabedahiru 39@gmail.com

SUNDAY JONATHAN (PhD).
Department of Human Kinetics and Health Education
Ibrahim Babangida University Lapai, Niger State

&

ABDUL MOHAMMED (PhD)
Department of Human Kinetics and Health Education
Ibrahim Babangida University Lapai, Niger State

Abstract
Advances in technology have taken over the work of man and made life very easy. Machines have taken over most of the physical work of man. This has led to a reduction in involvement in physically exhaustive activities. This also means a reduction in accidental fitness which was more achieved in the absence of machines, thus, revealing the mystery of the longevity of the past generation. The increased in sedentary behaviour has resulted in a sharp increase in overweight, obesity and related chronic conditions and illnesses. This study assessed how technological advances has promoted sedentary life behaviour, and the need harness the present technological trends and their application in physical training and excesses, it is recommended that as more inventions in the area of technological applications to the field of exercise are being unfolded, there is also the need to encourage the use of internet software and other techno sports gadgets to achieve the desired fitness necessary for health and wellbeing.
Keywords: ***Digital Technology, Physical Activity, Sedentary Life, Behavioural Challenges, Way Forward.***

Introduction

Engagement in movement and physical activities is a natural and inherent behaviour on which the survival of every living organism particularly man depends. Through movement, man can accomplish many of his life desires. Through this movement, he is also engaging in physical activities that are required for his well-being and longevity. As the man takes part in a series of occupational activities like participating in farming, trekking from one place to another such as the market, and in search for daily bread, it becomes clear that he is achieving some organic fitness that helps to maintain the body system through incidental exercises.

Since the appearance of the species that walked upright on two legs, new technologies have been developed to make life on this planet easier and more efficient.

However, these advances in technological development have robbed man of this ample opportunity for incidental exercises and accidental fitness. As a result of this technological development man invented machines that were directed to make work and life less physically demanding. According to Garrison & Deakin (1988), these inventions started six to seven thousand years ago with the invention of the wheel and the horse or cattle-drawn cart. Such inventions not only saved people the "effort" of walking, carrying, and lifting, but opened a new era of trade and inspired the development of novel transportation modalities. These new ideas materialized during the industrial revolution of 1750–1914 which led to the development of new transportation options on land, in the sea, and in the air. Advanced technologies in business improved work efficiency and profit while reducing the amount of physical work needed, but during the second half of the twentieth century, and particularly after the 70s, the "electronics and telecommunications revolution began." This period saw the widespread use of a variety of household appliances designed to improve communication (telephones) and decrease manual labour (computers, washing machines, vacuum cleaners) (Garrison & Deakin 1988).

While these inventions were meant to make life easy for mankind and improve productivity, it has either directly or indirectly led to a reduction in participation in physical activities that have helped to maintain the body system, leading to an increase in sedentary behaviour and a reduction in life expectancy. This seem to justify the argument/assumption that people in the past generation lived longer than the present generation. The longevity found in the past generation therefore could be attributed to their physical active life style as apposed to technological driven lifestyle of the modern time. Advancement in technology has undoubtedly come with advantages such as improved in productivity, but it also results in less participation in physical exercise which is a serious disadvantage to human health and wellbeing. According to Thompson, Sallis, Joy, Jaworski, Stuhr & Trilk. (2020) The technological revolution was not limited to improving productivity, lifestyle, and leisure but was also critical to launching modern medical field which started more than 2,000 years ago. Hippocrates, who is considered the "father of medicine," was the first to map the human anatomy and characterize diseases. He was also the first to treat diseases by focusing on changes to people's diet and physical activity, which in today's world we refer t "Exercise is Medicine" and/or "lifestyle medicine". The lack or less engagement in Exercise is referred to as sedentary behaviour.

The term" sedentary behaviour "was defined according to the World Health Organisation W.H.O (2020), as any behaviour characterized by an energy expenditure of $\leq$1.5 metabolic equivalents (METs) while in a sitting, reclining, or lying posture. This definition is often used in research and scholarly literature to describe inactive behaviours associated with sitting or lying down. Some examples of sedentary behaviour include television viewing, playing video games, using the computer, sitting at school or work. Another scholar, Owen N. Nkomo, defines sedentary behaviour as any waking behaviour characterized by an energy expenditure of 1.5 metabolic equivalents (METs) or less, while in a sitting, reclining, or lying posture. This definition aligns with the understanding that sedentary behaviour involves low levels of physical activity and minimal energy expenditure. A sedentary lifestyle contributes to artery hardening and plaque buildup in the arteries. When your arteries are stiff and narrow, your heart must work harder to circulate blood throughout the body, and this raises your blood pressure.

Physical Activity and Health

Physical activity is defined as any voluntary bodily movement produced by skeletal muscles that require energy expenditure. Physical activity encompasses all activities, at any intensity, performed during any time of day or night. It includes both exercise and incidental activity integrated into daily routine. This integrated activity may not be planned, structured, repetitive, or purposeful for the improvement of fitness, and may include activities such as walking to the local shop, cleaning, working, active transport, etc. Lack of physical activity is associated with a range of negative health outcomes, whereas increased physical activity can improve physical and mental health, as well as cognitive and increased physical activity and exercise capacity are the cornerstone of every lifestyle intervention for healthy and clinical populations at any age group due to the vast evidence for their effectiveness. Piercy, and Troiano (2018), stressed that since the first physical activity guidelines and recommendations publications, over 40 years ago, by the American College of Sports Medicine, hundreds of exercise guidelines, for almost every single population were written by the leading exercise and clinical institutions in the world. Moreover, national and international guidelines and recommendations for minimum levels of physical activity have been established in both the government and health sectors of numerous nations.

Since the first physical activity guidelines and recommendations publications, over 40 years ago, by the American College of Sports Medicine, hundreds of exercise guidelines, for almost every single population were written by the leading exercise and clinical institutions in the world. Moreover, national and international guidelines and recommendations for minimum levels of physical activity have been established in both the government and health sectors of numerous nations (Bull, Al-Ansari, Biddle, Borodulin, Buman, Cardon, 2020). Not adhering to these recommendations increases the risk of cardiovascular diseases, stroke, type 2 diabetes, and breast and colon cancers. In addition, performing at least some physical activity has already been associated with improved health outcomes Next to averting disease, physical activity contributes to other aspects of health, for example, a person's well-being and quality of life (Pawlowski, Downward, Rasciute and Bailey, Hillman, Arent, Petitpas. 2013]

While technological advancement has brought about inactivity, sedentary life, and the associated impact on health, Ding, Lawson, Kolbe-Alexander, Finkelstein, Katzmarzyk, & van Mechelen. 2016) said that healthcare costs are rising due to new technological possibilities, including expensive pharmaceuticals, increases in wages and prices, and an aging population. One other element in rising healthcare costs may be that unhealthy lifestyles, such as physical inactivity, may be associated with increased healthcare expenses. One global study showed the economic burden of physical inactivity to be substantial, especially in Western countries. The impact of physical inactivity on healthcare costs may be twofold. On the one hand, when physical activity levels increase, physical-inactivity-related disease incidence declines, with associated lowering effects on healthcare costs [Ding, Kolbe-Alexander, Nguyen, Katzmarzyk, Pratt, and Lawson 2016]. A review by Ding et al. (2017) focused on this aspect when assessing the economic burden of physical inactivity. On the other hand, reduced incidence of diseases associated with inactivity may extend people's lives. As was shown in studies on obesity and smoking, improved lifestyle indeed reduced healthcare costs of diseases related to unhealthy lifestyles, but increased costs for

unrelated diseases at the same time (van Baal, Polder, de Wit, Hoogenveen, Feenstra, Boshuizen 2018).

Technology and sedentary life

The term "sedentary" was defined W.H.O (2020), as any waking behaviour characterized by an energy expenditure of ≤1.5 metabolic equivalents (METs) while in a sitting, reclining, or lying. This definition is often used in research and scholarly literature to describe inactive behaviors associated with sitting or lying down (Tremblay, Aubert, Barnes, Saunders, Carson, Latimer-Cheung, Chastin, Altenburg, Chinapaw 2017). Sedentary behaviour has been identified as one of the leading preventable causes of death Sedentary behaviour is also associated with being overweight and obese and suffering from various forms of blood pressure or other sedentary lifestyles are detrimental and constitute great challenges to health in many ways, research studies have shown that people who live sedentary lifestyles are most likely to experience various types of hypokinetic disease. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may harm health (W.H.O, 2015). Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Blood is carried from the heart to all parts of the body in the vessels. Each time the heart beats, it pumps blood into the vessels. Blood pressure is created by the force of blood pushing against the walls of blood vessels (arteries) as it is pumped by the heart. The higher the pressure, the harder the heart has to pump

Although advances in technology have provided many benefits to society, new technology has also led to a substantial reduction in the amount of incidental physical activity. Physical activities, previously conducted as part of a "standard" working day or as part of domestic duties around the home (cleaning and cooking), have been reduced or replaced by machines. The relatively recent development of the internet and its accessibility on mobile devices (phones, tablets, and others) has also negatively impacted our physical activity. There are established associations between internet usage during leisure time and sedentary behaviour and obesity in children and adults (Wang, Beydoun, Liang, and Caballero & Kumanyika 2020). Indeed, the overall reduction in physical activity, irrespective of the cause, as well as the increase in the prevalence of sedentary behaviours are strongly associated with the development of one of the most serious health epidemics people have faced, the obesity epidemic, which can also be described as a syndemic as the risk of obesity is higher in those from low-socioeconomic status (SES) and pre-existing inequalities and social determinants of health (James, Leach, Kalamara, Shayeghi 2021).

Way forward

As a way to address the challenges of a sedentary lifestyle and its accompanying health consequences, Participation in physical activities has been recommended, this is a hope to reduce weight and enhance cardiovascular health promotions. This will lead to a reduction of high blood pressure. But with the frequency and duration of internet use increasing significantly over the last decade especially in the younger population (concomitant to a significant rise in internet addiction), promoting change in behaviour that requires reduced use, or disuse, of these technologies could be even more challenging (Ferrara, Corsello, Ianniello, Sbordone, Ehrich & Giardino 2017). This presents the question of whether it is possible for the technological advances that contributed to reductions in physical activity to be repurposed to promote it. This

indicates that to create a change in behaviour, the individual needs to understand the benefits of physical activity, they must value their health and the behaviours that support it, and their immediate affective (emotional) response to the stimulus (activity) must create more perceived enjoyment than the alternative (inactivity) (Ferrara, Corsello, Ianniello, Sbordone, Ehrich, Giardino, 2017). By retooling the technology that brings enjoyment can we ultimately use technologies to promote and motivate engagement in long-term physical activity? This is critically important as is one of our greatest challenges from a Planetary Health perspective is searching for ways to incentivize healthy behaviour change (Whitmee, Haines, Beyrer, Boltz, Capon & de Souza Dias, 2015).

There is increasing interest in the role that technology can play in improving the vitality of knowledge workers. A promising and widely adopted strategy to attain this goal is to reduce sedentary behaviour (SB) and increase physical activity (PA) (Ida, Hans, Carine, Rens, Aarnout, Pieter, and Steven 2020).

Over the years several studies have been conducted on the effect of physical activities on physical mental and emotional health Specialists in the field of physical education, human kinetics, and sports medicine have continued to conduct a series of studies in the area of application of the scientific principle to physical; training and the accompanied effect on health. Most results indicate that Fitness is associated with more desirable clinical outcomes, such as decreasing metabolic disease, cardiovascular disease, Alzheimer's disease risk, inflammation, and many other disease states not listed here. Exercise/physical activity is a proven modality for treating the disease of overweight and obesity.

However, management of this disease is best through dietary interventions and regular exercise. Exercise is an integral part of not only weight loss but overall health as well. A balanced hypo-caloric diet, aerobic training, and cognitive behavioural therapy (CBT) help reduce weight. Weight-reducing pharmacotherapy is indicated in individuals with a BMI greater than 30 kg/m2 with or without comorbidities. (Maesako, 2014).

According to Cardio, (2011), The healthcare team (nurse practitioner, primary healthcare provider, internist, endocrinologist, bariatric surgeon, pharmacist, and obesity nurse) should implement many strategies to increase physical activity and fitness for individuals living with obesity including utilizing "exercise vital signs," tracking exercise, motivational interviewing, and periodic check-ins. Currently, the following could potentially be implemented into practice to encourage patients living with obesity to exercise:

a. Utilizing exercise as a vital sign in individuals with obesity: Obtaining current exercise and physical activity habits from patients could serve as another vital sign and would include understanding the intensity, mode, and duration of the exercise performed weekly by the patient. Providers could have electronic medical records (EMRs) to prompt patients who are living with obesity to have discussions with the patient regarding their physical activity. These prompts on the EMR can be input by the medical assistants who may ask at the beginning of the appointment, just like taking blood pressure and pulse.

b. Utilizing exercise trackers: Several devices can track heart rate, motion, exercise, and beyond. Providers could potentially use these data to ensure that the patient is exercising, and could point towards potential problems that may arise due to abnormal heart or exercise responses. Examples include smart watches, cellular smartphones, pedometers, heart rate monitors, etc.
c. Motivational Interviewing: Furthermore, Nurses, Physicians, and anyone else involved in the healthcare setting for this patient could employ/use motivational interviewing techniques with the patient to reflect, plan, and execute different action plans to ensure that patients are meeting their exercise goals.
d. Check-Ins: Technology is allowing individuals to interact now more than ever. Physicians and patients could potentially use these technological advances to develop relationships further. Utilizing technology to have doctor-patient check-ins regarding exercise may increase the adherence of individuals living with obesity to exercise programs. These could include developing an app that alerts patients and/or the doctor when exercise habits are not sufficient, thus prompting a check-in from the physician using motivational interviewing asking why the patient has or hasn't exercised according to plan.

The idea of using technology to encourage physical activity has been around since the emergence of personal electronic devices. The earliest iteration could arguably be the pedometer. These devices have transitioned to wearable activity trackers with the emergence of fitness bands, smartwatches, and accessories that track steps, physical activity, heart rate, and additional health-related data (Karapanos, Gouveia, Hassenzahl, Forlizzi 2016). A large meta-analysis found that interventions that provided physical activity trackers for older people improved physical activity and mobility, but not necessarily quality of life (Oliveira, Sherrington, Zheng, Franco, Tiedemann, 2020). Overall, the short-term use of wearable activity trackers appears effective at increasing physical activity (steps per day) and reducing BMI, but the long-term effects on behaviour change have not been rigorously explored (Bravata, Smith-Spangler, Sundaram, Gienger, Linm & Lewis, 2007).

A recent qualitative study found that sustained use of activity trackers was influenced by an individual's perceived future value of data accumulation, opportunistic engagement, and the feeling of empowerment, but that positive changes in behaviour were also inextricably linked to the individual's ability to self-set goals before usage (Karapanos, Gouveia, Hassenzahl, Forlizzi 2016). These findings and those of Ryan and Deci support the ART framework, suggesting that enjoyment and opportunistic engagement can create a positive effect with exercise but that the reflective evaluation of an individual's goals and the intrinsic value of the activity remains critical (Ryan, Deci, 2000).

Recent advances in "exergaming" and virtual reality technologies also present an intriguing opportunity to reimagine how to engage in physical activity in the modern era. Given our premise that the enjoyment gleaned from gaming, social media, and other online interfaces is promoting physical inactivity, incorporating activity within these platforms is a promising approach for changing individuals' automatic decision-making processes and affective responses to physical activity. While the field as a whole is in its infancy, initial studies show some positive trends. Gamifying exercise through active video games can lead to reductions in cholesterol and body fat while increasing enjoyment and self-efficacy (McDonough, Pope, Zeng, Liu, Gao. 2020).

One study in healthy adults indicated that the improvements in blood glucose management from supervised exercise games were significantly greater than those of adults completing standard exercise alone (Bock, Dunsiger, Ciccolo, Serber, Wu, & Tilkemeier, 2019).

With the recent emergence of virtual reality technology, the opportunities for novel means of games of exercise are endless. While the field is in its infancy, early studies suggest that exercising with virtual reality technology has the potential to improve physical and psychological well-being in a range of individuals (Qian, McDonough, Gao. 2020). The accumulating evidence suggests some practical implications that should be explored. Increasing enjoyment of exercise through technology can lead to greater adoption of physical activity better health outcomes and improved well-being that in turn will assist in promoting healthy living. Perhaps rather than, or in addition to, focusing on decreasing screen time we need to explore the technologies that encourage or require movement while on these platforms,

The recent emergence of augmented and virtual reality technology in our mobile phones and headsets demonstrates how this technology-based physical activity could work in principle. There are a variety of online applications that utilize augmented reality or virtual reality to increase engagement in and enjoyment of physical activity through gamifying exercise (Coknaz, Mirzeoglu, Atasoy, Alkoy, Coknaz & Goral, 2019). These initial studies were relatively short, and it is unknown whether these types of applications can be modified to induce long-term behaviour changes that will result in clinically meaningful population-level improvements in obesity rates and physical function. Initial evidence also suggests that some of those embedded engagement prompts currently used to increase engagement in screen time (reminders, alerts, etc.) can also be used to prompt physical activity behaviours (Shrestha, Grgic, Wiesner, Parker, Podnar, Bennie, 2019).

Conclusion

Advances in Technology have brought into existence machines and software to take over physical responsibilities and duties that were hitherto performed by man, this is hope the enhance productivity. These have also led to less involvement in physical activities and the emergence of a sedentary life regime. Thus creating an enabling condition for inactive life and its associated diseases. Technology has also led to an increase in health costs. There is an urgent need for retooling current technology to promote movement and decrease sedentary behaviour. However, this would require a major industry shift in the success indicators for technology uptake. Currently, they rely on purely quantitative measures of engagement (duration, frequency). There is a need for a focus on social and public health benefits. Embedding public health researchers and discipline experts within the technology teams can help ensure there is both an economic and a health benefit within the products. People must, first of all, be sensitized to the need to emphasize active life behaviours and the resultant effect of sedentary life on health. As more inventions in the area of technological applications to the field of exercise are being unfolded, there is also the need to encourage the use of internet software and other techno sports gadgets to achieve the desired fitness necessary for health and wellbeing.

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