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RESEARCH ARTICLE

NECESSITY OF PHYSICAL ACTIVITY TO ENHANCE THE IMMUNITY POWER DURING THE COVID-19 PANDEMIC

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ABSTRACT

The increasing burden of Covid-19, a viral disease makes the search for extended understanding of natural immunity development through physical activity. Biological, neurological and psychological benefits generating out of physical activity helps to prevent viral disease like Covid-19.This paper provides a through and up to date review of studies examining the natural immunity development through physical activity. Respiratory diseases through viral infection and the effects of physical activity for immunity development is a rapidly developing and important field.

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INTRODUCTION

Novel Coronavirus is a global epidemic, 2020 is the infectious year worldwide because of the outbreak of this viral respiratory disease. Most of the countries are affected with infectious diseases caused by a recently discovered coronavirus. COVID-19 (coronavirus disease 2019) originated from Wuhan (Hubei, China), and spread throughout the world with rapid infection and deaths, COVID-19 was acquired from 3-bronchoalveolar lavage sample of a patient on December 30, 2019 in Wuhan Jingintan hospital. Further this Virus was found and isolated in lung and intestinal tissues of the challenged animals[1]. Nearly a century ago, the 1918 influenza pandemic was regarded as the most severe pandemic in recent history. The virus, known as H1N1, infected 500 million persons worldwide and claimed an estimated 50 million lives. The pandemic lasted nearly 2 years with sporadic activity characterized by 3 waves of occurrence. Nearly 100 years later, in January 2020, we found ourselves in the midst of another global pandemic, the novel coronavirus (coronavirus disease 2019, COVID- 19[2].

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Infectious and non-communicable diseases have always beset humans, but the recent appearance of COVID-19 has refocused public health perspectives to infectious disease. In the early part of the 20th century, advances in the prevention and treatment of infectious disease was primary, but deaths caused by non-communicable disease continued to rise[3]. Covid-19 is an infectious disease caused by the coronavirus of severe acute respiratory syndrome, which can cause respiratory infections. The clinical conditions vary from mild to moderate and at times evolve into severe. In its milder form, the manifestation of symptoms is similar to that of a common flu: symptoms such as fever, coughing, difficulty in breathing, muscle pain, headache and a sore throat and runny nose. The virus can be transmitted from one person to another through droplets of saliva or mucus, expelled through the mouth or nostrils when an infected person coughs or sneezes[77]. COVID-19 is a respiratory disease caused by plain acute respiratory syndrome-coronavirus 2 (SARS-CoV-2). The highly infectious and communicable characteristics, including asymptomatic transmission, of SARS-CoV-2, as well as the absence of a confirmed treatment, have augmented the spread of the disease and have stunned hospitals worldwide. While SARS-CoV-2 affects all demographic segments, COVID-19 disproportionally touches older adults and those with previoussituations[4].The foremost damage of the virus is on human health, including direct injury to the respiratory system, compromise of the immune

system, exacerbation of the underlying medical conditions, and eventually systematic failure and death[5]. The relatively long latency period of the virus of 5–12 days would allow the virus to significantly damage medullary neurons, and indeed, patients infected by SARS-CoV-2 reported severe neurologic symptoms manifested as acute cerebrovascular diseases, consciousness impairment and skeletal muscle symptoms [6]. Main sporting organisations have revealed their harmony with determinations to diminish the blow-out of the virus. For example, FIFA has joined with the World Health Organisation (WHO) and propelled a 'Pass the message to kick out coronavirus' movement led by renowned football players in 13 languages, mission on people to monitor five key phases to stop the blow-out of the disease concentrated on hand washing, coughing protocol, not touching one's face, physical aloofness and staying home if senseunwell[78]. It's likely that prolonged home stay may lead to increased sedentary behaviours, such as spending excessive amounts of time sitting, reclining, or lying down for screening activities (playing games, watching television, using mobile devices); droppingconsistent physical activity (hence lesser energy spending); or appealing in escaping activities that, subsequently, lead to an enlargeddanger for and probablefailing of long-lasting health circumstances[7].

METHODS

This review utilized an electronic search of databases such as PubMed, Google search and Microsoft academic search. An initial search was conducted using the following keywords: (Physical activity or exercise) and (natural immunity, covid - 19, nerve, respiratory system and stress).A total of 200 articles considered for assessment of abstracts for relevance to the aims of this review. Of these 118, studies were omitted after assessment of the full text if they did not observe the outcome of the physical movement or Covid-19 on the resistant system. A percentage of papers were originate via the orientation lists of the 200 full text articles. Finally, 82 articles were utilized in this review.

Physical activity during Covid-19: Physical activity is significant for stoppage and administration of manylong-lastingailments, containingcirculatory disease and type 2 diabetes [89]. People with higher levels of physical activity have minor all-cause death, enhancedresistant function, and improvedretrieval from superiorrespirational and bacterial infections [101112]. Physical activity and exercise participation improves myocardial function[13].Increasing myocardial strength and oxygen delivery while decreasing myocardial oxygen demand [14]. Physical activity and exercise induce molecular adaptations in multiple brain regions, improving functional and structural neural properties, allows for enhanced learning and skill acquisition [1516]. Support data come from epidemiologic and longitudinal studies reporting reduced disease risk following lifestyles incorporating daily physical activity and having higher cardiorespiratory fitness[17,18]. Regular physical activity and exercise promote cardiorespiratory fitness and longevity. Recommendation for healthy individuals during and following the COVID-19 pandemic is to remain physically active and exercise while socially distanced when you are well, stop exercise when you develop symptoms or signs of an infection, and return to physical activity and exercise slowly following recovery. Social distancing requires some changes in perspective while exercising.

Recent models suggest the 2-m diameter "bubble" of safety changes shape with movement. The slipstream of dirty air created by running or biking requires 5–20m of spacing for a person following directly behind an infected person[79]. Preclinical investigations reveal that endurance exercise training alters the abundance of ~70 cytosolic proteins and ~25 mitochondrial proteins in the diaphragm [19]. Studies investigating which of these proteins contribute to protection of the diaphragm against Ventilator-induced diaphragm dysfunction (VIDD) reveal that exercise-induced changes in both mitochondrial proteins (e.g., superoxide dismutase 2) and cytosolic proteins (e.g., heat shock protein 72) contribute to exercise preconditioning of the diaphragm[19]. Moderate exercise has been shown to enhance cell-mediated immunity and increase secretory IgA (SIgA), leading to improved immunity against infection[82]. Recent studies have also demonstrated that moderate physical activity reduces the incidence of upper respiratory tract infections (URTI) by as much as 30% [2021].A study of 8- to 10-yr-old children found no relationship between peak O2 consumption (VO2) and immune function, but body mass was found to be significantly correlated with SIgA concentration, serum leukocyte counts, monocytes, and granulocyte phagocytosis [22].

The impact of physical activity and exercise on non-communicable disease are well-documented and also impact the immune system and thus affects the bodies anti-virale defences [2324].Unfortunately, modern lifestyle behaviours promote sedentariness [23 2425]. The request of committed regular physical activity has developedand advocated for the defensive, healing, and degeneratedproperties of workout in a innumerable of metabolic and emotionalconflicts[8]. Exercise shelters a comprehensiverange of health benefits, from enhancingpsychological wellness by cultivatingattitudesituations and neuroplasticity via amplified brain-derived neurotropic influences (BDNF) levels[26]. A substantial number of both cross-sectional and longitudinal studies have indicated that regular physical exercise exerts diversified anti-inflammatory actions [2728].Particularly, muscle-derived interleukin (IL)-6 has been recognized as a pleiotropic myokine in the modulation of immuno- and inflammatory metabolism: it inhibits tumour necrosis factor (TNF) production [29] and stimulates, at the same time, the release of the anti-inflammatory cytokines IL-1ra and IL-10 [30] Furthermore, IL-6mediates the release of cortisol from adrenal gland and it may have systemic effects on the liver and adipose tissue [30]. IL-6 increases insulin secretion by up regulating glucagon-like peptide 1 (GLP-1) [31]. It increases insulin-stimulated glucose uptake both in skeletal muscle and adipose tissue and, in fact, IL-6 stimulates, through the activation of AMPK, both lypolisis and fat oxidation, peripherally and whole-body[32 33].Interestingly, recent studies showed that exercise, as a homeostatic stimulus, might diversify the gut micro biota enhancing the number of benign microbial communities[3435].Children and adults [24].

The public health recommendations (i.e., stay-at-home orders, closures of parks, gymnasiums, and fitness centres) to prevent SARS-CoV-2 spread have the potential to reduce daily physical activity. These recommendations are unfortunate because daily exercise may help combat the disease by boosting our immune systems and counteracting some of the co-morbidities like obesity, diabetes, hypertension, and serious heart conditions that make us more

susceptible to severe COVID- 19 illness [36]. The portions of the brain most adaptable to change (i.e., memory/learning, emotion, etc.) are the first enhanced by physical activity and exercise [37].Clearly, neurological deficits in addition to mental health conditions improve with physical activity and exercise which in turn prevents or reduces other health conditions associated with poor stress management, depression, and anxiety [383940]. Additional health benefits exist for preventing disease complications and improved quality of life. For instance, Daily physical activity and exercise enhances bone health by increasing bone mineral density. These interventions are recommended in the prevention and treatment of osteoporosis and to decrease the risk of future bone fractures[41]. Also, physical activity and exercise improve the immune system enabling the body to fight infectious diseases resulting in less overall susceptibility to sicknesses[42]. As part of this immune adaptation, lymphatic function is enhanced and inflammation is reduced by decreasing inflammatory cell accumulation[43].

Exercise also delivers immunological paybacks that are facilitated by improvedimmuno-surveillance via increased macrophage answers, enlarged flow of immunoglobulin and anti-inflammatory cytokines, and an weakening of inflammation[44].Hence, it is significant to inspire physical activity that stands by state and local moderation strategies to support with disease administration and rise physiologic backup further than the abrupt SARS-CoV-2 epidemic[45].Physical inactivity is associated with many detrimental effects, including loss of aerobic fitness (~7% reduction in V_O2 peak in healthy young adults), musculoskeletal, and cognitive decline[46].Older men and women have significantly lower mortality risk when moderate cardiorespiratory fitness levels are maintained[47]. All human behaviours connected to health are advanced and moulded in childhood and adolescence, these phases of life are of the topmost significance for the advancement of physical activity[4849].Studies reported that staying home at the prolonged time might lead to sedentary behaviors, such as spending more time on sitting activities, playing video games. Watching television, decreasing regular outdoor activity and exercises leads to an increased risk of chronic health conditions [7].

Starting an Exercise Program: Staying healthy requires daily physical activity. Our body is constantly sensing internal environment and responding to these changes. Staying healthy requires daily physical activity. Our body is constantly sensing internal environment and responding to these changes [50].The increased demands from the contracting skeletal muscles during exercise represent a major challenge to the body homeostasis provoking a plethora ofresponses in several organs. The metabolic rate of the skeletal muscle can rise even 100-fold on activation when compared to resting conditions. In order to support the energy demand of the working muscle fibres, temporary acute responses occur in our organism to meet the physical activity and exercise challenge. As a result of the accumulation of activity sessions, the organism adapts to the metabolic demands. Physical activity and exercise adaptations refer to the long-term changes that occur in our body as a consequence of physical activity and training. Heart hypertrophy or resting bradycardia is two well-known examples of these adaptations[51]. However, the musculoskeletal system, one of the largest tissues in the body, is the main target of exercise training. Plasticity describes the ability of our muscles to adapt to variations in activity and in working demand. The adaptive event involves the whole muscle fiber structure from the sarcolemma to the mitochondria, including the myofibrils, the extracellular matrix, as well as capillaries surrounding the muscle fibres [51]. The exercise effect on the brain can elicit systemic influences on the entire body, as exercise-induced euphoria is associated with the release of endogenous opioids (endorphins). Endorphins are identified as three distinct peptides termed alpha-endorphins, beta-endorphins, and gamma-endorphins. Euphoria is significantly increased after running and is inversely correlated with opioid binding in prefrontal/orbitofrontal cortices, the anterior cingulate cortex, bilateral insula, parainsular cortex, and temporoparietal regions (region-specific effects in fronto limbic brain areas that are involved in the processing of affective states and mood)[52].

During the COVID-19 pandemic, physical activity and exercise will play both a positive and a negative role in individual health outcomes. On the negative side COVID-19 infection increases risk of cardiac damage and cardiac death during exercise and the increased risk may extend into the post infection time period. Physical activity during any systemic viral disease is not recommended because the inflammatory reaction within the muscle cells and coronary artery walls put an affected individual at risk for sudden cardiac death during and after the infection. Data from post mortem analysis is showing this to be true for COVID-19 patients also[53]. An early epidemiological study suggested that intense, prolonged exercise was associated with an increase in upper respiratory tract infections. This work led to the concept of the inverted J theory, where moderate exercise reduces, and prolonged, high intensity exercise increases susceptibility to infection [44]. Social-distancing procedures may edge the occasion for many to join in planned exercise courses, they have also enlargedprobableoccasions for leisure-time physical activity such as private walks, hill-walking, canoeing, cultivation, plot conservation, and other open-airevents. Traditional aerobic endurance actions such as jogging, running, biking, and paddling are still very active means of meeting physical activity strategies given that one either can carefully take part in these eventsout-of-doors (while maintaining appropriate social distancing) or has ergometer apparatus in their home. Pilates, yoga, and dancing are also outstanding deeds for those unable to exercise outside of the home. These previous activities necessitatenominalgear and there is a plenty of courses that are accessible through videos or online. Furthermore, these exercises are a countless substitute to traditional aerobic actions, as they are accessible and can be improved for novices to further innovative athletes. Physique weight, isometric, resistance band, and hand-held weight exercises can also be a satisfactory substitute to old-style resistance working out routines. Social media, virtual support groups, and fitness apps with public support can aid to deliver the inspiration and drive essential to enable these conductfluctuations[54]. Many have a habit of to be less physically dynamic, have extended screen time, unbalanced sleep arrangements as well as poorer nourishments, causing in weight increase and loss of physical ability. Low-income families are particularly susceptible to adverse effects ofstay at home-based guidelines as they incline to have inferior housings and more limited places, creating it hard to involve in physical exercise.

Physical doings donates to the decrease of total cardiac risks, dropping both systolic and diastolic blood pressure and modifying left ventricular hypertrophy. Physical activity as also famous positive properties on metabolic disorder and insulin sensitivity [55].In this context, home-based exercise should be implemented. Home-based exercise is not a novel topic, and its positive impact has been reported on both physical and psychological variables in various clinical populations [56]. The increase in physical inactivity is associated with technology advances including increased use of television, computer, mobile devices, and video games [57].Additional problems arise with a physically inactive lifestyle including impaired circulation, osteoporosis, arthritis and/or other skeletal disabilities, diminished self-concept, greater dependence on others for daily living, reduced opportunity and ability for normal social interactions, and overall diminished quality of life [58].Inactivity is the fourth-leading cause of mortality according to the World Health Organization[80]. Men practice physical activity mainly for social and competitive reasons. Moreover, they prefer to practice sports, outdoor and/or in public places like the gym and fitness clubs. Females are more inclined to exercise in home-setting, practising aerobics, dancing, yoga, pilates or circuits with push-ups, squats, planks and jumping jacks. Furthermore, the lower variation in physical activity levels between before and during quarantine found in women is possibly explained by the higher amount of housework physical activity than males [59].

A beginning exercise program should start at low intensities for short durations and progress slowly to more intense physical activity or exercise periods of longer durations. Because these activities are easily performed at home, difficulties in finding facilities with proper space and specific equipment is reduced or eliminated. A goal of any beginning physical activity or exercise program is to progressively work toward completing at least one-half hour of moderate physical activity every day or at least twenty minutes of vigorous physical activity every other day of the week. Ideally, strengthening-type activities are included in daily activities at least twice a week. When starting a physical activity or exercise program while in the midst of a pandemic, public health recommendations for social distancing and hygiene practices are paramount considerations when starting a physical activity or exercise program. Becoming physically active and reducing sedentary behavior is easily accomplished by avoiding sitting for long time periods, taking short movement or activity breaks, utilizing online exercise classes, and using mobile technologies such as telephone applications and wearable sensors to encourage movement. Examples of home exercises not requiring large spaces or equipment while easily practiced at all times of the day include walking, stair climbing, lifting and carrying groceries, chair squats, pushups, sit-ups, rope jumping, yoga, Pilates, and Tai Chi[81]. Individuals susceptible to chronic diseases such as cardiovascular or pulmonary disease should seek advice from health care providers regarding safe exercises. Recommendations for children and youth aged five to 17 years are the accumulation of at least 60 minutes of moderate - to vigorous-intensity daily physical activity. In addition, vigorous-intensity activities that strengthen muscle and bone are recommended at least three times per week [25].

MENTAL HEALTH RISK DURING COVID-19: The applicability of lockdown due to COVID-19 not only affects people's mental health but also affecting their physical health due to reduce activity in their daily routine. Previous studies reported that approximately 35% of individuals experiencing psychological stress. Among them, female shows higher psychological stress than male. [60]. The magnitude of mental health among healthcare workers who are treating COVID-19, they found that among 68.7% of health-workers, depression (50.4%), anxiety (44.6%), insomnia (34.0%) and distress (71.5%) were reported. However, long-term physical inactivity may reduce the immune function of the individuals and can affect the normal physiological system of the body [61]. Furthermore, physical activity is implicated in the modulation of different trophic factors, such as brain-derived neurotrophic factor (BDNF). BDNF, whose levels are up regulated following exercise, represents the most abundant neurotrophin in the brain, which positively influences both anxiety and depressive disorders [62].Negative impact on psychological well-being due to the reduction of physical activity levels is a dogma, currently in the literature there is only one study conducted in Canada that can strengthen our present results, regarding the worsen of psychophysical conditions during a period of forced rest due to a pandemic [63].

One of the most common protections against virus infections is quarantine. However, social isolation often causes psychological and mental disorders including acute stress disorder, exhaustion, detachment from others, irritability, insomnia, poor concentration indecisiveness, fear, and anxiety. Data suggest that depression, anxiety, and post traumatic disorders have significant effects on the immune system, resulting in mast cell activation, increased generation of cytokines like IL-1, IL-37, TNFα, IL-6, and C-reactive protein [64]. However, quarantine-associated decline in the immune system as a result of the development of depression or traumatic disorders can be prevented and/or attenuated. Indeed, the inflammatory process generated by Robot Operating System (ROS) can be more effectively detoxified by antioxidant systems invarious organs including the brain of well-trained individuals from adaptations to exercise training [65]. In addition, exercise training can efficiently decrease depression, and is one of the power modulator of the neuroprotective and anti-depressive effects of physical activity and exercise is the brain derived neurotrophic factor [66].The concept that physical activity provides a beneficial effect against the development of mental disorders. Individuals who exercise regularly exhibit fewer depressive and anxiety symptoms [67]. There are severalmotives why physical activity is angorgeoushealingpossibility in psychiatry. It has a little side-effect outline and can be modified according to a patient's medicinal co-morbidities and practical status[68,69].Physical activity also enhances elf-esteem has less stigmatization than psychotherapy, may reduce the use of pharmacotherapies in major depressive disorder [70] and has a optimistic effect on cardio- metabolic risk issuesapplicable to various psychiatric ailments (e.g. Continuingswelling, gut fat mass, glucocorticoid feeling, glucose controller, and insulin feeling[7172].Physical activity has beneficial effects on depressive symptom, It is found to have robust Effects on the depressive phenotype found in major depressive disorder [69].Physical activity interventions are found to have a multitude of effects on neuro immune processes [73].

Studies have publicised that exercise schedules have a disturbance effect (from undesirable feelings and reflexions), run a logic of mastery via the knowledge of new skills [74] and hence improve self-efficacy [75] and self-worth[76].Exercise regimes in a group location may have a advantageous consequence via exercise social talentshortages[69].

DISCUSSION

In conclusion, regular exercise training of moderate intensity is believed to exert beneficial effects on immune function and must be associated to the suggestions. We sought to clarify the importance of the regular exercise of a moderate intensity and the likely risks evolvement to inadequate exercise habits, and physiological alteration. In this way, we advise moderation, tranquillity, and patience in this pandemic period. The use of eHealth and exercise videos, which focuses on encouraging and delivering physical activity through the Internet, mobile technologies, and television [8].In this respect, we strongly echo Dr. Steven Blair's quote from Dr. Ken Powell: " Some activity is better than none, and more is better than less" (p. 525) [6]. Householdactionsdeliver an occasion for individuals to stay fit and healthy by practising modest activities where as staying at home. Numerous nations have currently executed lockdowns, compelling publics to stay at home and only go out in the occasion of an emergency. These decisions will disturb peoples' psychological and physical health, particularly those who are used to regular outdoor physical activities. We are all conscious of the importance of our mental health and the need to progress our immune system, which is enormously significant for fighting sickness. Remaining at home can main to a lot of stress, worry and mental sorrow. The best way to overcome these problems is to substitute outdoors events with home-based events, such as bodyweight exercise and dance-based aerobic exercise, and if possible, aerobic high-intensity exercise using stationary bikes or rowing ergometers, also with self-paced protocols. These activities can be combined with, but not substituted by, stretching and active gaming. Collectively, these papers provide a snapshot of the importance of initiating and maintaining physical activity during and after the COVID-19 global pandemic. They also address the importance of establishing a public health research agenda and social systems to advance knowledge about physical activity during and after COVID-19 and to assure all persons have an equal opportunity to engage in physical activity behaviours, respectively. In viewing multiple health benefits ofphysical activity, we are reminded that physical activity is a behaviour that lends itself to a coordinated, multidisciplinary team approach to address adequately its multiple dimensions. This approach is especially relevant in the presence of the COVID-19 global pandemic. From this perspective, we hope the articles in this special topic will serve as both scientific and public health impetus for stimulating research ideas that will lead to a better understanding of the impact of physical activity in helping boost the immune system, lower the risk of infection from the exposure to the coronavirus, and identify strategies to help children and adults remain physically active during the global pandemic.

Conclusion

Home stay is a central security step that can limit infections from distribution widely. But continued home stays can rise deeds that lead to idleness and pay to nervousness and unhappiness, which in turn can lead to an inactive lifestyle known to result in a variety of chronic health conditions. Preserving consistent physical activity and regularly training in a safe home situation is a significant approach for strong living during the corona virus crisis. We recommend the governmental and voluntary agencies to motivate the people to relay more on self-immunity development through physical activity. Imparting proper knowledge regarding the beneficial effects ofphysical activity is the need of the hour. Physical activity after abiding the norms framed for safety can be promoted among the society. We have to understand that the healthy people are an asset to the nation and weak is a liability to the nation.

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