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Review Article / Derleme

Social insulation during COVID-19: The importance of physical activity

COVID-19 sürecinde sosyal izolasyon: Fiziksel aktivitenin önemi

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ABSTRACT

Concerns about the increasing spread of COVID-19 have raised and the global epidemic has led virtually all countries around the world to take quick protective measures. Staying at home against infection risks has been a key safety step that can limit the spread of infections to a wider population. However, this measure resulted in sedentary behaviors, such as playing games on the digital media, watching television, spending excessive time on mobile devices, and decreased physical activity. In this study, the following issues are addressed: importance of physical activity, which has a positive effect on health protection and immune system strengthening, anxiety, and depression reduction during the COVID-19 outbreak; informing people about the available opportunities to be active; the benefits of being active; the amount of activity one should do; and, how safe performing physical activity is. During the pandemic, it is vital to disseminate appropriate messages to encourage the public to engage in physical activity, and to provide information about the benefits of adopting an active lifestyle.

Keywords: *Coronavirus, COVID-19, outbreak, pandemic, physical activity*

ÖZ

COVID-19'un artan yayılımıyla ilgili endişeler artmış, küresel salgın birçok ülkenin hızlı ve koruyucu önlemler almasına yol açmıştır. Enfeksiyon riskine karşı evde kalma, enfeksiyonların geniş kitlelere yayılmasını sınırlandırabilen temel bir güvenlik adımı olmuştur. Uzun süre evde kalmak; dijital ortamda oyun oynamak, televizyon izlemek, mobil cihazlar kullanarak yapılan aktivitelere aşırı miktarda zaman harcamak gibi hareketsiz davranışlara, fiziksel aktivitenin azalmasına yol açmıştır. Bu çalışmada, pandemi süresince fiziksel aktivitenin, sağlığın korunması ve bağışıklık sisteminin güçlenmesi, kaygı ve depresyonun azaltılmasında olumlu etkisi olduğuna dikkat çekmek, insanları aktif olmaları için hangi fırsatların var olduğu konusunda bilgilendirmenin yanı sıra, aktif olmanın ne gibi yararları olduğu, kişinin ne kadar aktivite yapması gerektiği ve fiziksel aktivitenin ne kadar güvenli olduğu bilgisi sunulmaktadır. Pandemi süresince toplumu fiziksel aktivite yapmaya teşvik etmek, aktif yaşam tarzı hakkında bilgi vermek için uygun mesajların oluşturulması hayati önem taşımaktadır.

Anahtar Sözcükler: *Koronavirüs, COVID-19, salgın, pandemi, fiziksel aktivite*

INTRODUCTION

A public health emergency began in Wuhan, China, in December 2019, when a new beta coronavirus, named 2019-new coronavirus (SARS-CoV-2), with a high morbidity and mortality, broke out (1,2). The World Health Organization (WHO) has announced that the virus causing the disease is named as "COVID-19" (3,4). On January 30, 2020, WHO declared the outbreak as “public health emergency of international concern”, and on March 11, as a pandemic (5).

Symptoms of COVID-19 include fever, cough, shortness of breath, muscle pain, headache, and diarrhea (6). The virus is an RNA coronavirus that spreads from person to person through individuals who are in close contact with each other; by means of respiratory droplets that occur after an infected person coughs or sneezes; or by contact with a contaminated person (1,2). Although no vaccine or drug is available for the treatment of this virus-borne disease, many researchers around the world have been conducting intensive research on the source of the virus and its extensions. On the other hand, questions such as the incubation period of the virus, risk assessment, and effective treatment methods have not been answered yet (7).

Health effects of inactive life due to the pandemic

The global epidemic has led many countries around the world to take quick protective measures. In China, cities were completely locked up, travel bans were enforced, and schools and universities were completely closed (8). These measures started with social distancing and self-quarantine practices, mandatory quarantines, travel restrictions, cancellation of international flights, followed by travel restrictions within the country, and finally curfews were declared. On the other hand, education and training activities have been physically interrupted, and flexible and home-office applications have started in the workplace while online education has been initiated.

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WHO reported that, in 2008, approximately 31% of adults aged 15 years and over globally, were found to fulfil insufficient physical activity. It is estimated that approximately 3.2 million deaths each year result from insufficient physical activity. It was determined that the prevalence of inadequate physical activity was highest in the USA and the Eastern Mediterranean Region. In both regions, while 50% of women were sufficiently active, the frequency of inadequate physical activity in men was 40% in the USA and 36% in the Eastern Mediterranean. It was reported that the South-East Asia Region has the lowest percentages (15% for men and 19% for women) (9). After COVID-19, a total of 19,144,639 steps/day measured by 455404 people in 187 different countries, worldwide; then, a 5.5% reduction in average steps (287 steps) within 10 days after the pandemic declaration and a 27.3% decrease within 30 days (1432 steps) were reported. The maximum decrease of 48.7% was recorded in Italy, and a maximum decrease of 6.9% was recorded in Sweden. In countries such as Italy and Iran, in which regional COVID-19 outbreaks occurred previously, earlier declines in the number of steps were observed. In US cities, the number of step trends revealed similarities, despite the wide international variability. Studies to demonstrate the real impact of worldwide isolation on physical activity levels proceed (10).

In a previous study, individuals' physical activity levels were compared virtually in all countries in the same period last year with a wearable device that track physical activity levels of 30 million users in the quarantine process, and it was found that there was a 7% to 38% reduction in the average number of steps. This showed that quarantine caused a significant drop in physical activity levels (11). In studies on the effects of quarantine, negative psychological effects such as post-traumatic stress symptoms, confusion, and anger were reported. Restriction of movement, loss of the usual routine, and reduced social and physical contact with others are often said to cause boredom, frustration, and a feeling of isolation. It has been shown that there is serious concern about the harmful effects of physical inactivity, especially with limitation of movement (12,13).

COVID-19 is a new virus that causes a respiratory disease (14), affecting the immune cells (15). SARS-CoV-2 causes an infection in the alveolar epithelial cells via the ACE2 receptor. The destruction of epithelial cells and increased permeability causes the release of the virus, which triggers natural immunity. Natural immune cells, such as macrophages and neutrophils, both capture the virus and secrete numerous cytokines and chemokines. These cytokines and chemokines also allow monocytes and T lymphocytes to accumulate in the infected area. CD4 + helper T cells stimulate B cells to proliferate, differentiate, and produce virus-specific antibodies. CD8 + T cells, on the other hand, limit the infection with their cytotoxic effects. If the infection cannot be cleared completely, it causes hyperinflammation. Hyperinflammation and cytokine storm syndrome are also observed in patients with severe COVID-19. Cytokine storm has been reported to cause secondary hemophagocytic lymphohistiocytosis and is associated with multiple organ failure and death. Strong physical exercise leads to the activation of the immune system, which includes cells capable of producing ROS, such as neutrophils, monocytes and macrophages (16,17).

Physical activity, which is one of the main components of healthy life (18), causes an increase in immune system cells, thereby strengthening the immune system (19). Experts recommend appropriate physical activities that will increase the protective effect of our immune system against the virus before the virus gets activated in the body and makes us sick (20) The general consensus in the literature on exercise immunology is that the immune system responds positively to exercise, but this response depends on the severity, duration, and the type of the exercise (19-21). Cardiovascular exercise makes important contributions to the development of the immune system as it aims to strengthen the muscles attacked by the virus (22). Epidemiological studies suggest that regular physical activity is associated with a decrease in the incidence and mortality of influenza and pneumonia (23). In addition, Woods et al. (24) reported that regular exercises improved responses to vaccines.

Given the concerns about the increased spread of COVID-19, staying at home has been a key measure against the risk of infection, which can limit the spread of infections to large masses (25). However, staying at home causes sedentary behaviors such as spending too much time playing digital games, watching television, spending excessive time on mobile devices, and lying down (26). COVID-19 is a disease imposing higher risk for obese individuals (15). Limitations that prevent participation in outdoor activities and traveling freely cause long periods of inactivity at home, and these conditions that limit physical activity cause several health problems, such as anxiety, depressed mood, boredom, anxiety and depression (27).

The occurrence of quarantine-related stress and increased stress-related nutrient intake cause the individual to enter a vicious circle, which results in the deterioration of sleep patterns. Therefore, it is important to consume foods that contain or promote the synthesis of serotonin and melatonin at dinner. Melatonin activates the immune system cells either directly through melatonin receptors or indirectly via changes in steroid hormones (28).

Increased eating frequency, increased use of alcoholic beverages, and decreased energy consumption cause weight gains (12). Decreased physical activity negatively affects the immune system activity, worsening the condition of people with chronic diseases such as heart problems, diabetes, and high blood pressure (29,30).

Entering the quarantine period suddenly, and thus stopping exercise abruptly causes insulin resistance to initiate rapidly in muscle tissue, and thereby the use of muscle glycogen starts to decrease, resulting in muscle atrophy. Metabolic and cardiovascular adaptations can lead to impaired aerobic capacity and increased blood pressure after an exercise break, even just for two weeks. Unused muscles lead to reduced energy consumption, increased atherogenic lipoprotein production, and relocation of metabolic substrates in the liver; thus, by accelerating atherosclerotic disease, it causes obesity and lipid accumulation in blood vessels (31). Abrupt discontinuation of physical activity can lead to decreased venous blood circulation and coronary perfusion, which may make individuals susceptible to deterioration in health when they restart exercising. Resting heart rate increases after the acute cessation of physical activity, and the risk of cardiovascular disease and mortality may increase even more (32,33).

Physical activity and immune system relationships in the pandemic process

During COVID-19, performing simple, safe, and easy exercises is very important to maintain the fitness level. Exercises can be performed in quarantine conditions since they require no special place and tools. In terms of indoor exercises, very modern audio-visual tools, such as social media, e-health, indoor exercise practices, and physical activity videos, are used over the internet, such as YouTube. A large number of dance, aerobics, yoga, pilates, and strength training programs are available. Examples of home exercises are: yoga, walking in the house, indoor running, climbing stairs, home exercise bikes, and treadmills. Simple household items such as filled water bottles and cans or food packages can be useful as weight exercises. The high number of repetitions during exercise can strain the person, even when working with low weights. Exercises that do not require equipment, such as push-ups and sit-ups performed with one's own body weight, and that can be practiced at all times are also useful (25,34).

Table 1 presents aerobic training categories for trained and untrained individuals, with exclusive intensity data related to heart rate, rating of perceived exertion (RPE), and intensity data regarding the extent of breathlessness during exercise.

Body-weight exercises involving the upper and lower body are push-ups, pull-ups, squats, lunges, box jumps, jumping rope, burpees, etc (Table 2).

Table 1. Examples of home-based bodyweight training exercises

Exercise	Frequency	Benefits
Dynamic warm-up: High-knee skips, butt kicks, high kicks, lateral shuffles		
Bodyweight squats	1-2 sets of 10 reps-beginner	Lower-body strength and power
	2-3 sets of 20 reps-advanced	Functional outcomes
Push-ups	1-2 sets of 10 reps-beginner	Upper-body strength and endurance
	2-3 sets of 20 reps-advanced	
Walking lunges	1-2 sets of 5 reps-beginner	Hamstring strength and running speed
	2-3 sets of 10 reps-advanced	
Planks	1-2 sets of 20 s -beginner	Posture, upper+lower body iso. strength
	2-4 sets of 40 s -advanced	
Jumping jacks	1-2 sets of 15 reps-beginner	Endurance and core strength
	2-4 sets of 20 reps-advanced	
Sit-ups	1-2 sets of 15 reps-beginner	Abdominal and core strength
	2-4 sets of 20 reps-advanced	
Cool-down: Static stretching and flexibility exercises		

Table 2. Intensity categories of home-based aerobic exercise training for various target groups

	Trained/Active		Sedentary		Patients/Elderly		
Intensity	**% HRmax**	**RPE**	**% HRmax**	**RPE**	**% HRmax**	**RPE**	**Additional intensity clues**
Low	65 (50-80%)	2 (1-3)	60 (50-75%)	2 (1-3)	60 (50-70%)	2 (1-3)	Easy, breath is moderate
Moderate	80 (70-90%)	4 (3-5)	75 (70-85%)	4 (3-5)	70 (65-80%)	3 (2-4)	Somewhat hard, breath quickens, talking is possible, but not singing
High	90 (85-100%)	6 (5-10)	85 (80-95%)	5 (4-8)	80 (70-90%)	5 (3-7)	Challenging, breath is deep and rapid, only few words can be said without pausing for breath

HRmax: heart rate % of maximal heart rate (estimated as 220-age); RPE: rating of preceived exertion during aerobic training (scale relates to following intensity; 0: rest, 2: easy, 3: moderate, 5: hard, 7: very hard, 10: max)

A most important question in the field of sports and exercise medicine is whether it is appropriate to perform physical activity during a viral respiratory outbreak (35). There is currently no scientific data on the effects of exercise on coronavirus, but in epidemiological studies conducted after the 2009 H1N1 influenza epidemic, physical activity before infection has been shown to be effective in reducing the incidence, duration, or severity of the condition (36). Significant reductions in mortality risk were reported in patients with respiratory disease, pneumonia and aspiration pneumonia in runners, including those with diabetes (37).

Exercise is the most effective therapy to reduce symptoms of depression (38). Aerobic exercise has a positive effect on patients diagnosed with anxiety disorder (39). COVID-19 disease can be asymptomatic for several days. High intensity exercises can cause the exacerbation of the COVID-19 virus, especially in obese people, due to the production of oxidants and suppression of the immune system. The most convenient way to deal with the COVID-19 virus are moderate-intensity aerobic exercises and physical activities, such as brisk walking (40-42). It has been reported that exercises lasting for at least 150 min per week, including muscle strengthening activities for 20 min a day (25), at least two days a week, with appropriate rest intervals, is effective in preventing chronic diseases (43). Physical activity is known to reduce the risk of systemic inflammation, excess body mass, and diseases endangering immune function (22,44).

The effect of pandemic on mass sports

Competition sports, high-intensity exercises in public gyms, and crowded environments should be avoided as they can be very dangerous than beneficial (35). Because of the high risk of virus spreading from person to person, or through contaminated surfaces, exercise environments should be well ventilated and the use of personal equipment should be preferred. Safe, simple, and practical home exercises are suitable for this purpose to prevent this airborne coronavirus and maintain fitness levels. This program can include aerobic (walking at home), strengthening, stretching, and balance exercises, or a combination of these (25). All kinds of activities involving large audience in crowded indoor facilities, swimming pools, barbell bars, shot put, and javelin increase the risk of transmission of COVID-19. Another concern regarding the risks is imposed by athletes, executives, and spectators participating in international competitions, especially from countries where the virus is highly prevalent. This can speed up international or intercontinental transfers. Athletes or trainers with suspected COVID-19 disease are strongly recommended for two weeks of solitary isolation before camps and games/matches. Therefore, it makes sense to cancel or postpone these competitions (35).

It is very important that competitions which cannot be canceled due to certain reasons should be carried out with maximum attention to sanitary principles to protect the audience. There exists a huge danger waiting for us at the Tokyo 2020 Olympic Games and Paralympic Games, which will accommodate very large masses. Tokyo 2020 Olympic Games are expected to take place this summer with the participation of more than 200 countries, 15,000 athletes, and 20 million visitors. Authorities such as the International Olympic Committee (IOC) and the WHO are expected to postpone or cancel these important games (35). For instance, the International Olympic Committee announced on 24 March 2020 that the Tokyo 2020 Olympic and Paralympic Games will be postponed to the summer of 2021. In support of this decision, the importance of protecting the athlete's health has been emphasized in various statements reported by international sports organizations (45).

In the face of this new coronavirus pandemic, the WHO, the Centers for Disease Control and Prevention, and other public health counseling organizations encourage regular participation in physical activity, as long as they remain committed to public health and community safety rules, and are not contraindicated in particular individuals (4,46-48).

Limiting individuals' freedom of travel, and practices such as quarantine should not yield in the prevention of individuals from engaging in physical activity. Many studies show that physical activity contributes positively to the health of individuals with different diseases (29). Children, the elderly, and individuals with chronic illnesses must always seek medical advice before starting any physical activity program.

CONCLUSION

To conclude, it is very important to perform physical activity during the COVID-19 outbreak in order to protect the health and strengthen the immune system. Any decision taken by the authorities and restricting the individual's ability for outdoor mobility should not prevent physical activity. Physical activity has a positive effect on reducing anxiety and depression that occur during the quarantine period causing inactivity.

Maintaining a regular physical activity routine in a fairly safe environment is considered to be an appropriate strategy for healthy living and fitness during the coronavirus pandemic. In this research, these topics are presented: indoor activity options available for the general public, benefits of being active, how much activity a person should perform, and how safe physical activity is. It is vital to dissemi-

nate appropriate messages to encourage the society to engage in physical activity and to provide information about active lifestyles.

Conflict of Interest / Çıkar Çatışması

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