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Original Article

Comparison of Physical Activity Before and During COVID-19 and Its Relationship With Mental Well-being of People in Chaharmahal and Bakhtiari Province

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Abstract

Background and aims: Due to the widespread prevalence of the coronavirus disease 2019 (COVID-19), to overcome and understand these conditions, it is necessary to survey the physical and psychological implications on individuals within the community to uncover effective solutions. This study aimed to investigate the changes in the level of physical activity and psychological well-being due to quarantine induced by COVID-19 in Chaharmahal and Bakhtiari province.

Methods: This is a cross-sectional study during the first peak of COVID-19 disease (April 10 to May 10, 2020). The International Online Physical Activity Questionnaire and the Short Mood Assessment Questionnaire were used to assess physical activity (before and during outbreak) and mood status (during outbreak), respectively, among 627 people in Chaharmahal and Bakhtiari province.

Results: The samples consisted of male (20%) and female (80%) subjects. Upon comparing the physical activity before the disease outbreak and during the initial outbreak, it was demonstrated that the intensity ($P<0.001$), duration ($P<0.001$), and frequency ($P<0.001$) of physical activity significantly decreased after the outbreak of COVID-19. However, there was no difference between men and women in intensity, duration, and frequency of physical activity as well as psychological status ($P=0.099$). Further, no significant relationship was observed between physical activity variables (intensity, $P=0.214$, duration, $P=0.386$, and repetition, $P=0.122$) and psychological status. However, a significant positive relationship was found between adherence to quarantine and mental wellbeing ($P=0.001$).

Conclusion: According to the results, the level of physical activity of the subjects decreased during the COVID-19 outbreak compared to before the outbreak, but the decrease in physical activity did not affect their mental state. However, the individuals who adhered to quarantine conditions experienced a worse negative mood compared to other groups. It seems that in addition to observing social distancing measures and adherence to quarantine, individuals' overall health and physical activity levels are effective factors that can improve the body's physiological systems and the psychological state and influence the positive mood of people.

Keywords: COVID-19, Physical activity, Mental well-being, Exercise

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Introduction

A significant challenge has been posed to the health care systems around the world by the advent of the outbreak of the new coronavirus disease 2019 (COVID-19). Like other parts of the world, the COVID-19 pandemic has caused irreparable damage to the health system in Iran and is one of the most critical conditions facing human beings in the last 100 years.[1] According to Shahrekord University of Medical Sciences in Chaharmahal and Bakhtiari province, a total of 1333 people have died of this disease since the beginning of August 2021. The COVID-19 disease negatively impacts individuals by reducing daily energy expenditure, increasing energy intake, changing sleep patterns, and reducing physical activity, which has been regarded as having detrimental effects on one's health. These behavioral patterns have led to an exponential growth in mental health problems, metabolic and cardiovascular diseases, and an overall unhealthy lifestyle. A major consequence of quarantine and its related stressors include significant changes in people's lifestyles and eating habits. Stress, depression, and anxiety foster people's inclination to eat more foods, especially items rich in sugar and high in calories.[2,3] The first factors contributing to the reduction of the spread of the virus have been deemed to be social isolation and quarantine measures.[4] Despite the positive effects and successful experiences of quarantine and social distancing in terms of controlling the COVID-19 epidemic, these limitations

are naturally associated with inactivity and a sedentary lifestyle[5] which can potentially increase an inactive lifestyle that could be physically and mentally harmful to the health of millions of people around the world.[6] The World Health Organization (WHO) has emphasized the need to maintain adequate physical activity levels during quarantine.[7] The community level of physical activity has decreased due to the lack of access to sports clubs, water sports centers, fitness equipment, and outdoor sports during quarantine period.[8] Following the outbreak of the COVID-19 pandemic, it has been shown that the average number of daily walks in different countries has decreased with a reduction of between 7% and 38% postulated in different countries (from 10 000 to less than 1500).[9,10]

Decreased daily physical activity and sedentary behaviors are associated with a number of complications, including impaired blood lipids, vascular disorders, and high insulin resistance, which predispose individuals to conditions such as being overweight and consequently increase cardio-metabolic risk index.[10] Quarantine conditions, long-term presence at home, and fear and stress of contracting the illness have been associated with facilitating psychological disorders. Decreased physical activity during quarantine can also change one's mental state in itself.[11] Quarantine is associated with increases in stress and depression, which subsequently leads to unhealthy eating habits and reduced physical activity, too.[3]

Although research pertaining to the physiological and psychological consequences of COVID-19 is in its initial stages, it has been found that people who are more physically active had fewer mental disorders during the quarantine period.[12-14] Research during the COVID-19 pandemic has shown that more than 96% of athletes who became infected with the COVID-19 virus either showed no symptoms or had very mild symptoms.[12] Another study found that athletes experienced fewer mental disorders during quarantine than non-athletes.[13] The perceived stress during quarantine has also been reported less in athletes than in non-athlete populations.[14] Swami et al found that during the COVID-19 pandemic, stress and anxiety caused by COVID-19 yielded a significant negative effect on a person's self-image.[15] Moreover, the results of Pieh and colleagues' study showed that changes in quality of life, depressive symptoms (21%), and anxiety symptoms (19%) were greater during COVID-19 compared to previously gathered epidemiological data. This has also been a particularly stressful time for young youth (< 35 years), women, unemployed, and those of low-economic status.[16] Therefore, it seems that the stress and anxiety caused by COVID-19 pandemic disease cause negative changes in one's mental state, and when they are combined with a decrease in physical activity in the community, the effects can be more harmful.

Therefore, the aim of this study was to investigate the changes in physical activity during the COVID-19 pandemic compared to pre-pandemic period and to explore the relationship between physical activity changes and mental well-being in Chaharmahal and Bakhtiari province.

Materials and Methods

Type of Study

This was a cross-sectional study which was conducted via online surveys.

Population Under Study

All individuals who resided in Chaharmahal and Bakhtiari province and experienced the conditions of quarantine were included in the study. Exclusion criteria included people under 10 years of age and incomplete questionnaires. A total of 667 volunteers completed the questionnaire as a sample within 1 month (from April 4 to May 10, 2020) during the first wave of COVID-19 outbreak. Forty responses were incomplete and therefore removed from the dataset.

Data Collection Tools

The questionnaire used in this study was available to the public through social media, including WhatsApp, Telegram, official channels of Shahrekord University, and other available centers of Chaharmahal and Bakhtiari province. The questionnaire includes 55 items related to demographic, economic, health status, quarantine adherence, physical activity, and mood characteristics. The physical activity items assessed the level of physical activity before and during the outbreak of COVID-19. Exercise levels were measured by inquiring about the type, frequency, and intensity of exercise (from low to very high) before and during the COVID-19 pandemic, which was extracted from the 5-item physical activity questionnaire developed based on Cho's study (Physical Activity Questionnaire). The test-retest reliability of the physical activity questionnaire measured by Cho was between 0.61 and 0.91,[17,18] and it was 0.87 in the present study.

To calculate the perception of mental well-being during quarantine due to the outbreak of COVID-19, the shortened version of the Brunel Mood Scale was administered, which is a short online mood assessment questionnaire.[19] The questionnaire included items related to the 16 emotional states of anger, mental fatigue, vitality, hesitation, moodiness, frustration, physical fatigue, irritability, discouragement, tiredness, depression, laziness, alertness and awareness, anger, activism, and power. In the mood test, the participants were asked to express their current and past week feelings according to the instructions. Each response was scored from 0 to 4. The consistency values (Cronbach's alpha) in all dimensions and the total scale varied from 0.82 to 0.96,[20] and in the present study, the consistency of total scale was 0.90.

Statistical Analyses

The Kolmogorov-Smirnov test was used to evaluate the normal distribution of data. Wilcoxon test was used to compare the changes in physical activity variables before

and after the COVID-19 pandemic and to further examine the sex differences in the variables of physical activity and mental state. In addition, the Spearman correlation coefficient was used to investigate the relationship between research variables. The level of significance was set at P value < 0.05. All statistical analyses were computed utilizing SPSS® 25.0.

Results

According to the obtained results, 627 people completed the questionnaires. The mean age of participants was 25.48 ± 6.42 years (10-78 years). These participants included 20.2% male whose mean age was 30.86 ± 10.69 years and 79.8% female with mean age of 24.47 ± 9.49 years (Table 1). Table 1 presents the frequency and percentage of demographic characteristics of participants. As shown in this table, 80.1% (n = 502), 11% (n = 69), and 8.9% (n = 56) of people live in urban, rural, and suburb areas, respectively. Regarding the incidence of COVID 19, it was found that 51.7% of people were negative, 47% did not know their status, and only 1% had positive COVID-19 test. Interestingly, about 36.2% of people followed strict and mandatory health protocols, 38.1% were a little careless, 17.1% were careless several times, and 7% were indifferent (Table 1).

Table 2 presents the mental status at the time of the outbreak of the COVID-19 as well as the amount of changes in the intensity, time, and frequency of exercise during the outbreak of COVID-19 pandemic compared to the time before the pandemic.

The results showed a significant decrease in repetition (P = 0.001), intensity (P = 0.001), and duration (P = 0.001) of training when compared to the time before the pandemic (Figure 1).

However, according to Figure 2, the results showed that there is no gender relation between the physical activity and mental health variables, intensity (P = 0.162), duration (P = 0.994), and repetition of physical activity (P = 0.649).

According to Figure 3, the total mood status (P = 0.099), positive mood (P = 0.323), and negative mood (P = 0.136) were independent of the gender variable as well.

As illustrated in Table 3, there was no significant relationship between intensity (r = 0.051, P = 0.214), duration (r = 0.036, P = 0.386), and repetition (r = 0.062, P = 0.122) of physical activity with mental status. On the other hand, the results showed a significant positive relationship between adherence to quarantine and mental wellbeing (r = -0.144, P = 0.001). The individuals who adhered to quarantine conditions experienced an adverse negative mood when compared to other groups. Further, no significant relationship was observed between adherence to quarantine and exercise variables.

Discussion

The aim of this study was to evaluate the physical activity and psychological status of the population of Chaharmahal and Bakhtiari province at the time of the outbreak of

Table 1. Descriptive Data for Demographic Characteristics of Participants

Variables		No. (%)
Age	Teenagers (10-18)	135 (21.5)
	Young (19-35)	384 (61.2)
	Middle-aged (36-55)	102 (16.3)
	Elder ((≥ 55)	6 (1)
	Total	627 (100)
Gender	Male	133 (20.2)
	Female	494 (79.8)
	Total	627 (100)
Marital status	Single	424 (66.7)
	Married	208 (32.7)
	Divorced	4 (0.6)
	Total	636 (100)
Living environment	Urban	502 (80.1)
	Rural	69 (11)
	Suburbs	56 (8.9)
	Total	627 (100)
Education	PhD	21 (3.3)
	Masters	100 (15.9)
	Bachelor	83 (13.2)
	Associate	23 (3.7)
	Vocational	6 (1)
	Diploma	180 (28.7)
	High school	159 (25.4)
	Junior School	55 (8.8)
	Total	627 (100)
Job	Retired	8 (1)
	Unemployed	71 (11.3)
	Housewife	55 (8.8)
	Self-employment	44 (7)
	Student	295 (47)
	Kaput	10 (1.6)
	Part time	45 (7.2)
	Full-time	93 (14.8)
	Military	6 (1)
	Total	627 (100)
COVID-19 test	Negative	324 (51.7)
	Positive	6 (1)
	Not test	297 (47.4)
	Total	627 (100)
Family income	Very high	13 (2.1)
	High	32 (5.1)
	Medium	222 (35.4)
	Low	107 (17.1)
	Very Low	8 (1.3)
	No Income	87 (13.9)
	Unknown	117 (18.7)
	Total	586 (100)
Adherence to quarantine	Strict and mandatory observance	227 (36.2)
	Nonconformity	10 (1.6)
	Careless several times	107 (17.1)
	A little carefree	239 (38.1)
	Indifferent	44 (7)
	Total	627 (100)

Note. COVID-19: Coronavirus disease 2019.

Table 2. Mental Status During COVID-19 and Exercise Variable Changes in Participations

Variables	Time/Status	Median	IQR			Z	*P* Value
			Q1	Q2	Q3		
Mental status	Total	41.00	32.00	41.00	48.25	-21.463	0.0001
	Positive	7.00	5.00	7.00	10.00		
	Negative	34.00	25.00	34.00	41.00		
Exercise repetition changes	Before pandemic	3.00	1.00	3.00	4.00	-10.744	0.001
	During pandemic	1.00	0.50	1.00	3.00		
Exercise intensity changes	Before pandemic	2.00	2.00	2.00	3.00	-5.172	0.001
	During pandemic	2.00	1.00	2.00	2.00		
Exercise time changes	Before pandemic	2.00	2.00	2.00	2.00	-14.422	0.001
	During pandemic	2.00	2.00	2.00	2.00		

Note. COVID-19: Coronavirus disease 2019; IQR: Interquartile range.

Table 3. The relationship Between Research Variables

Variable	Exercise Intensity	Exercise Time	Exercise Repetition	Mental Status
Mental status	R=0.051, *P*=0.214	R=0.036, *P*=0.386	R=0.062, *P*=0.122	-
Adhere to quarantine	R=-0.032, *P*=0.435	R=-0.049, *P*=0.242	R=-0.070, *P*=0.079	R=-0.144, *P*=0.001

COVID-19 disease. The results of the study demonstrated a significant decrease in the amount of physical activity (e.g., intensity, frequency, and duration) during quarantine compared with the time before the outbreak with no significant difference between men and women.

In a similar study in Markazi province, it was reported that the rate of physical activity in adults decreased significantly during this disease, and despite the fact that the rate of physical activity was higher in men than women, the rate of decline in men was higher than that of women.[21] In a study in China, it was reported that about 58% of people were not physically active during COVID-19 quarantine. According to the WHO, inadequate physical activity increased dramatically in the early stages of the COVID-19 outbreak in China (27.5% versus 57.5% worldwide).[22] In Canada, it was found that 40% of inactive people became more inactive, and 22% of active people became less active. In addition, 33% of inactive people were more active during the outbreak, while 40% of those who were previously active were more active.[23] Moreover, in Croatia, it has been reported that the rate of physical activity of adolescents during the outbreak of COVID-19 disease decreased compared to the time before the outbreak, and the living place had a significant effect on reducing the level of physical activity which was more pronounced among urban adolescents.[24]

Assessing levels of physical activity is an important issue in general health, as having adequate physical activity is associated with a higher quality of life dependent on health.[24] In contrast, inactive behaviors and lack of adequate physical activity are health risk factors during the outbreak of COVID-19. Recent studies have shown that prolonged periods of inactivity and more sustained time sitting are associated with decreased lipoprotein lipase activity, decreased glucose tolerance, and decreased glucose-stimulated insulin secretion.[22]

During the outbreak of COVID-19 disease, as the level of physical activity decreased, the time spent on watching TV, computer, cell phone, etc. (screen time) increased. A recent study reported that the screen time was about 261 minutes per day during quarantine. At the time of the lockdown, more than half of the adults had temporarily sedentary lifestyles and experienced inadequate physical activity, more screen time, and poor mood which may have a significant impact on their health risks.[22] It is noteworthy that people who participated in strenuous physical activity

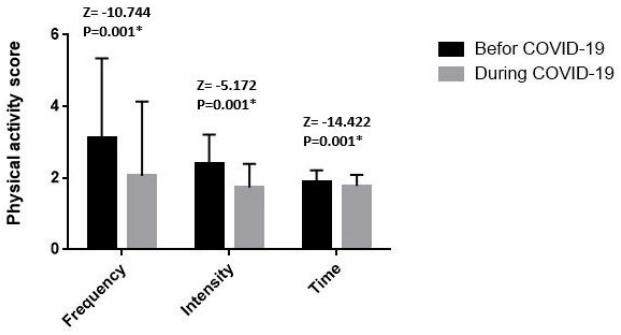

Figure 1. The Score of Physical Activity Variables During the COVID-19 Pandemic Compared to Before the Pandemic. *Note.* COVID-19: Coronavirus disease 2019. * Significant decrease during the COVID-19 pandemic compared to before the pandemic.

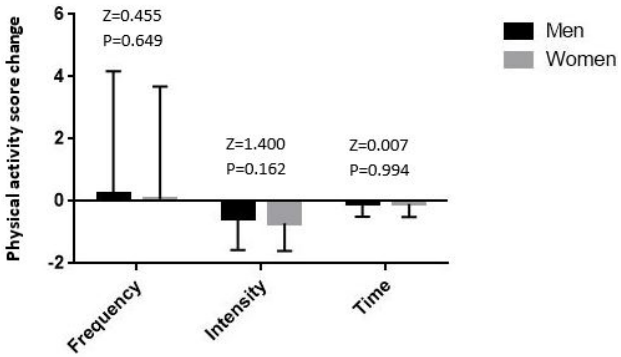

Figure 2. Gender Differences on Changes in the Score of Physical Activity Variables During the COVID-19 Pandemic Compared to Before the Pandemic. *Note.* COVID-19: Coronavirus disease 2019.

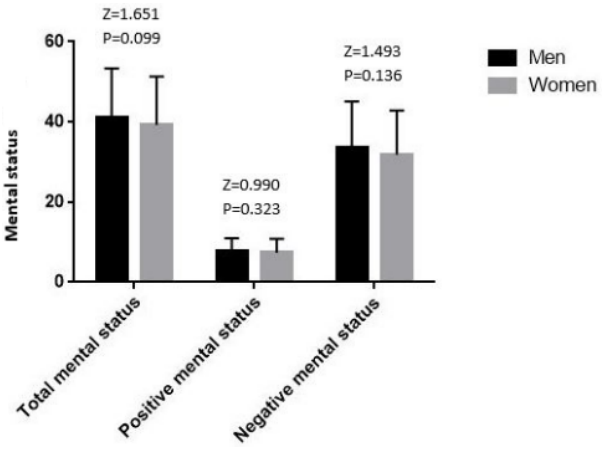

Figure 3. Gender Differences in Mental Status During the COVID-19 Pandemic. *Note.* COVID-19: Coronavirus disease 2019.

spent less time on screen time, meaning that the physical activity may be used as an effective way to reduce inactivity and screen time.[22,25]

It is clear that physical activity is a healthy lifestyle and plays a significant role in reducing the risk of disease and mortality. Researchers have described the link between the risk of upper respiratory tract infections and regular exercise as a "J-shaped curve"; that is, the risk of infection decreases with increasing the amount of exercise, but the high intensity exercise and professionality will increase the risk of respiratory infection.[25]

In a long-term study which lasted about 10 years, Williams et al found that deaths from Sepsis, pneumonia, and the flu reduced in relation to exercise.[26] Other similar studies have confirmed the effectiveness of moderate-intensity exercise with a lower risk of respiratory and infectious diseases as well as improved immune system functioning.[25-29] It has been confirmed that regular and moderate exercise improve the antibacterial and antiviral status of the immune system, reduce the inflammation, and suspend the weakness of the immune system.[30] Epidemiological studies have shown that regular exercise is associated with better immune responses to respiratory pathogens such as seasonal flu because active people often experience less infections due to the fact that they have better management and more limited consequences than those who were sedentary.[4] Based on this evidence, physical activity and exercise can play a preventive role in the development of COVID-19 disease by improving their efficiency of the immune system and may act as a form of vaccination.

The results also indicated that gender differences had no effect on the psychological state of individuals. No significant relationship was observed between the level of physical activity and psychological factors either. However, it was found that the individuals who were more committed to quarantine experienced a decrease in their psychological states. During the COVID-19 outbreak, it was apparent that quarantine measures were the most common and effective strategy to prevent the spread of the virus; however, it may negatively impact the mental health of people during quarantine and induce some psychological disorders such as emotional disorders, depression, stress, mood swings, irritability, insomnia, attention deficit disorder, post-traumatic stress disorder (PTSD), anger, and emotional numbness.[31,32]

According to scholarly studies, getting infected and infecting others are the most common causes of stress and mental disorders. Amongst other common concerns were fear of prolonged quarantine, lack of adequate family and social support, fatigue, and boredom. In addition, factors such as unpleasant thoughts (e.g., feelings of loneliness, frustration, denial, and labeling) have been found to cause unwillingness to remain quarantined for long periods of time and disregard related issues.[31]

Contrary to the results of this study, in many recent studies it has been reported that patients with COVID-19 have an unfavorable psychological state and experience disorders such as anxiety, fear, depression, emotional changes, negative thoughts, insomnia, and PTSD.[31,33] Among these, PTSD is one of the most important psychological disorders that can harm the mental health of patients with COVID-19 and is associated with prevalent panic.[34,35] The disorder occurs when people experience life-threatening conditions; therefore, the current condition and prevalence of COVID-19 virus can be a cause of PTSD symptoms.[31]

Anxiety and depression are other important psychological disorders that have been exacerbated during the outbreak of COVID-19 disease. A recent study examining the level of anxiety among Iranians (10 754 subjects) at the time of the COVID-19 outbreak found that about one-fifth of the population experienced severe to extremely severe anxiety, and the level of anxiety was higher among the women. Further, the level of anxiety in the age group of 21-40 years was higher than the other age groups, and anxiety levels were significantly higher among the people who had a COVID-19 infected person in their family, relatives, or friends. Interestingly, with the increase in the level of education, the levels of anxiety have also increased significantly; ironically, news followers had more severe symptoms related to increased anxiety levels.[36] Similarly, a study in China found that more than a quarter of people experienced symptoms of moderate to severe anxiety during COVID-19 with women suffering more from symptoms of anxiety, stress, and depression.[37] During the flu epidemic in an Australian study, it was exemplified that the psychological distress in people living in an area with higher prevalence of the disease experienced more psychological distress. This study also showcased that less educated and younger groups were more prone to the risk of psychological distress.[36]

Based on the results of the present study and other studies conducted on the Iranian population.[38,39] including the aforementioned studies, special attention should be paid to provide psychosocial care during the outbreak of COVID-19. Physical activities and exercises in this regard are the most effective strategies to improve psychological

well-being. Physical activity has an effective outcome; furthermore, existence of physical and mental health concerns and resistance to the Corona virus reduce socio-economic stress and help medical staff during home quarantine.[22] It has been found that physical activity plays an important role in suppressing the stress response induced by the sympathetic nervous system response prevalent in this particular virus.[23] In particular, inactive individuals who increased their physical activity or maintained their previous level of physical activity at the time of the onset of COVID-19 disease showed higher levels of social, emotional, and psychological health along with decreased states of anxiety. In addition, adults who exercised regularly exhibited fewer symptoms of anxiety and depression than their similar inactive counterparts, and exercising significantly reduced anxiety among healthy adults.[23]

These results have also been confirmed in a recent study in Canada where the well-being of sedentary people was found to be significantly lower than that of the active people, and those who were more physically active scored higher on mental health; in addition, inactive people who became more active after the outbreak or did physical activity outdoors experienced lower levels of anxiety.[23] Being active and maintaining regular physical activity are essential for mental and physical health during quarantine. Fortunately, a wide range of sports activities such as aerobics and strength training can be accessible using apps and the virtual spaces that can be done at home. However, more safety measures and adherence to health protocols are needed to reduce the risk of COVID-19.[40,41] Currently, it is recommended to avoid sports-related activities in crowded venues and indoors. It does seem that using a mask during sports activities is also a good way to deal with the transmission of the virus. Decontamination of the environment and sports equipment in the club, washing hands thoroughly after exercise, and not touching sensitive areas such as the eyes and nose are good ways to prevent the spread of the virus for individuals who continue to engage in physical activities outside their own homes.[25] Moderate-intensity aerobic exercise (e.g., brisk walking) outdoors can be a good alternative cardio exercise with a special focus on keeping a safe distance from others and avoiding contact with potentially contaminated surfaces.[42]

While most studies have focused on the effect of aerobic exercise on immune function, several recent studies have reported that strength training and psycho-physical exercises such as tai chi and yoga can also help immune function.[40] However, the goal we should pursue is to do at least 30 minutes of moderate-intensity or 20 minutes of high-intensity physical activity each day. It is suggested to have a combination of both intensity and strength activities on a daily basis. Children, the elderly, and Iranian population as a whole who have already experienced symptoms of the disease or who are prone to cardiovascular or pulmonary diseases should consult with their physician prior to establishing an exercise routine.[43] One of the limitations of this study was the lack of a clinical or interview study, which is recommended to be addressed in future studies. Another shortcoming of the present study is the lack of assessment of the mental state of individuals before the COVID-19 outbreak, which made us fail the comparison of the rate of change of this factor.

Conclusion

According to the results of the present study, the level of physical activity of people in Chaharmahal and Bakhtiari province decreased during the COVID-19 outbreak, but these conditions did not have a negative impact on their mental state.

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Authors' Contribution

MR, AA, MM, and MF conceived and designed the study. Data analysis was performed by MM and MR. Preparation of the first draft of the manuscript was done by MR and MM, and all authors reviewed and revised the manuscript. In addition, all authors approved the final draft of the manuscript.

Conflict of Interest Disclosures

The authors have no conflict of interests to declare.

Ethical Approval

The study received approval from the Human Research Ethics Board at the Sport Sciences Research Institute of Iran (IR.SSRC.REC.1399.070).

References

1. Yoosefi Lebni J, Abbas J, Moradi F, Salahshoor MR, Chaboksavar F, Irandoost SF, et al. How the COVID-19 pandemic effected economic, social, political, and cultural factors: a lesson from Iran. Int J Soc Psychiatry. 2021;67(3):298-300. doi: 10.1177/0020764020939984.
2. Mediouni M, Madiouni R, Kaczor-Urbanowicz KE. COVID-19: how the quarantine could lead to the depreobesity. Obes Med. 2020;19:100255. doi: 10.1016/j.obmed.2020.100255.
3. Mattioli AV, Sciomer S, Cocchi C, Maffei S, Gallina S. Quarantine during COVID-19 outbreak: changes in diet and physical activity increase the risk of cardiovascular disease. Nutr Metab Cardiovasc Dis. 2020;30(9):1409-17. doi: 10.1016/j.numecd.2020.05.020.
4. Ravalli S, Musumeci G. Coronavirus outbreak in Italy: physiological benefits of home-based exercise during pandemic. J Funct Morphol Kinesiol. 2020;5(2):31. doi: 10.3390/jfmk5020031.
5. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): the need to maintain regular physical activity while taking precautions. J Sport Health Sci. 2020;9(2):103-4. doi: 10.1016/j.jshs.2020.02.001.
6. Owen N, Sparling PB, Healy GN, Dunstan DW, Matthews CE. Sedentary behavior: emerging evidence for a new health risk. Mayo Clin Proc. 2010;85(12):1138-41. doi: 10.4065/mcp.2010.0444.
7. Mardaniyan Ghahfarrokhi M, Banitalebi E, Faramarzi M, Ghorbanpoor Dashtaki M, Earnest CP. 2019 novel coronavirus: emphasis on maintaining optimal levels of physical activity under self-quarantine conditions. Int J Epidemiol Res.

2020;7(2):49-51. doi: 10.34172/ijer.2020.09.
8. Constandt B, Thibaut E, De Bosscher V, Scheerder J, Ricour M, Willem A. Exercising in times of lockdown: an analysis of the impact of COVID-19 on levels and patterns of exercise among adults in Belgium. Int J Environ Res Public Health. 2020;17(11):4144. doi: 10.3390/ijerph17114144.
9. Tison GH, Avram R, Kuhar P, Abreau S, Marcus GM, Pletcher MJ, et al. Worldwide effect of COVID-19 on physical activity: a descriptive study. Ann Intern Med. 2020;173(9):767-70. doi: 10.7326/m20-2665.
10. King AJ, Burke LM, Halson SL, Hawley JA. The challenge of maintaining metabolic health during a global pandemic. Sports Med. 2020;50(7):1233-41. doi: 10.1007/s40279-020-01295-8.
11. Mutz M, Gerke M. Sport and exercise in times of self-quarantine: how Germans changed their behaviour at the beginning of the COVID-19 pandemic. Int Rev Sociol Sport. 2021;56(3):305-16. doi: 10.1177/1012690220934335.
12. Brito D, Meester S, Yanamala N, Patel HB, Balcik BJ, Casaclang-Verzosa G, et al. High prevalence of pericardial involvement in college student athletes recovering from COVID-19. JACC Cardiovasc Imaging. 2021;14(3):541-55. doi: 10.1016/j.jcmg.2020.10.023.
13. Şenışık S, Denerel N, Köyağasıoğlu O, Tunç S. The effect of isolation on athletes' mental health during the COVID-19 pandemic. Phys Sportsmed. 2021;49(2):187-93. doi: 10.1080/00913847.2020.1807297.
14. di Fronso S, Costa S, Montesano C, Di Gruttola F, Ciofi EG, Morgilli L, et al. The effects of COVID-19 pandemic on perceived stress and psychobiosocial states in Italian athletes. Int J Sport Exerc Psychol. 2022;20(1):79-91. doi: 10.1080/1612197X.2020.1802612.
15. Swami V, Horne G, Furnham A. COVID-19-related stress and anxiety are associated with negative body image in adults from the United Kingdom. Pers Individ Dif. 2021;170:110426. doi: 10.1016/j.paid.2020.110426.
16. Pieh C, Budimir S, Probst T. The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. J Psychosom Res. 2020;136:110186. doi: 10.1016/j.jpsychores.2020.110186.
17. Cho MH. Are Korean adults meeting the recommendation for physical activity during leisure time? J Phys Ther Sci. 2014;26(6):841-4. doi: 10.1589/jpts.26.841.
18. Cho MH. Preliminary reliability of the five item physical activity questionnaire. J Phys Ther Sci. 2016;28(12):3393-7. doi: 10.1589/jpts.28.3393.
19. Terry PC, Lane AM, Fogarty GJ. Construct validity of the profile of mood states—adolescents for use with adults. Psychol Sport Exerc. 2003;4(2):125-39. doi: 10.1016/S1469-0292(01)00035-8.
20. Curran SL, Andrykowski MA, Studts JL. Short form of the profile of mood states (POMS-SF): psychometric information. Psychol Assess. 1995;7(1):80-3.
21. Saremi A, Aghababa A, Bahrami A, Bahari M. COVID-19, physical activity and mental well-being in adults living in Markazi province: an online cross-sectional study. EBNESINA. 2020;22(3):4-12. doi: 10.22034/22.3.4. [Persian].
22. Qin F, Song Y, Nassis GP, Zhao L, Dong Y, Zhao C, et al. Physical activity, screen time, and emotional well-being during the 2019 novel coronavirus outbreak in China. Int J Environ Res Public Health. 2020;17(14):5170. doi: 10.3390/ijerph17145170.
23. Lesser IA, Nienhuis CP. The impact of COVID-19 on physical activity behavior and well-being of Canadians. Int J Environ Res Public Health. 2020;17(11):3899. doi: 10.3390/ijerph17113899.
24. Zenic N, Taiar R, Gilic B, Blazevic M, Maric D, Pojskic H, et al. Levels and changes of physical activity in adolescents during the COVID-19 pandemic: contextualizing urban vs. rural living environment. Appl Sci. 2020;10(11):3997. doi: 10.3390/app10113997.
25. Shirvani H, Rostamkhani F. Exercise considerations during coronavirus disease 2019 (COVID-19) outbreak: a narrative review. J Mil Med. 2020;22(2):161-8. doi: 10.30491/jmm.22.2.161.
26. Williams PT. Reduced total and cause-specific mortality from walking and running in diabetes. Med Sci Sports Exerc. 2014;46(5):933-9. doi: 10.1249/mss.0000000000000197.
27. de Araújo AL, Silva LC, Fernandes JR, Matias Mde S, Boas LS, Machado CM, et al. Elderly men with moderate and intense training lifestyle present sustained higher antibody responses to influenza vaccine. Age (Dordr). 2015;37(6):105. doi: 10.1007/s11357-015-9843-4.
28. Wong CM, Lai HK, Ou CQ, Ho SY, Chan KP, Thach TQ, et al. Is exercise protective against influenza-associated mortality? PLoS One. 2008;3(5):e2108. doi: 10.1371/journal.pone.0002108.
29. Williams PT. Dose-response relationship between exercise and respiratory disease mortality. Med Sci Sports Exerc. 2014;46(4):711-7. doi: 10.1249/mss.0000000000000142.
30. Dimitrov S, Hulteng E, Hong S. Inflammation and exercise: Inhibition of monocytic intracellular TNF production by acute exercise via β2-adrenergic activation. Brain Behav Immun. 2017;61:60-8. doi: 10.1016/j.bbi.2016.12.017.
31. Shahyad S, Mohammadi MT. Psychological impacts of COVID-19 outbreak on mental health status of society individuals: a narrative review. J Mil Med. 2020;22(2):184-92. doi: 10.30491/jmm.22.2.184.
32. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet. 2020;395(10227):912-20. doi: 10.1016/s0140-6736(20)30460-8.
33. Yao H, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. Lancet Psychiatry. 2020;7(4):e21. doi: 10.1016/s2215-0366(20)30090-0.
34. Bahramnia M, Ramak N, Sangani A. The role of perceived mental stress in the health of suspected cases of COVID-19. J Mil Med. 2020;22(2):115-21. doi: 10.30491/jmm.22.2.115.
35. Bo HX, Li W, Yang Y, Wang Y, Zhang Q, Cheung T, et al. Posttraumatic stress symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. Psychol Med. 2021;51(6):1052-3. doi: 10.1017/s0033291720000999.
36. Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. Asian J Psychiatr. 2020;51:102076. doi: 10.1016/j.ajp.2020.102076.
37. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health. 2020;17(5):1729. doi: 10.3390/ijerph17051729.
38. Zandifar A, Badrfam R. Iranian mental health during the COVID-19 epidemic. Asian J Psychiatr. 2020;51:101990. doi: 10.1016/j.ajp.2020.101990.
39. Javadi SM, Arian M, Qorbani-Vanajemi M. The need for psychosocial interventions to manage the coronavirus crisis. Iran J Psychiatry Behav Sci. 2020;14(1):e102546. doi: 10.5812/ijpbs.102546.

40. Zhu W. Should, and how can, exercise be done during a coronavirus outbreak? An interview with Dr. Jeffrey A. Woods. J Sport Health Sci. 2020;9(2):105-7. doi: 10.1016/j.jshs.2020.01.005.
41. Lippi G, Henry BM, Sanchis-Gomar F. Physical inactivity and cardiovascular disease at the time of coronavirus disease 2019 (COVID-19). Eur J Prev Cardiol. 2020;27(9):906-8. doi: 10.1177/2047487320916823.
42. Halabchi F, Ahmadinejad Z, Selk-Ghaffari M. COVID-19 epidemic: exercise or not to exercise; that is the question! Asian J Sports Med 2020;11(1):e102630. doi: 10.5812/asjsm.102630.
43. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): the need to maintain regular physical activity while taking precautions. J Sport Health Sci. 2020;9(2):103-4. doi: 10.1016/j.jshs.2020.02.001.