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The Level of Students' Participation in Sports and Extracurricular Activities Following Educational Programs on Virtual Networks

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A B S T R A C T

Objective: The COVID-19 pandemic has changed the way millions of people around the world learn and teach, and innovation in education could provide ways to address the COVID-19 pandemic. The outbreak of the COVID-19 virus has brought about significant changes to the education system. This study aimed to investigate the level of students' participation in sports and extracurricular activities following participation in online educational programs in Guilan Province.

Methods and Materials: The statistical population of this study was all boys' and girls' students in elementary (boys: 71,707, girls: 70,646), middle school (boys: 47,124, girls: 45,293) and high school (boys: 42,051, girls: 42,322) in Guilan Province. A total of 1035 questionnaires were filled out and collected by boy students, and 983 questionnaires were filled out and collected by girl students. The data collection method was a virtual questionnaire using the online questionnaire (Porsline site), and the information was collected by completing the questionnaire in a self-report manner; also, their demographic characteristics were recorded. Since the target population in this study was students, the questionnaires were completed under the supervision and with the help of their parents.

Findings: The results showed that 71% of students did not engage in regular physical activity before participating in physical activities following the educational programs on virtual networks. After participating in the educational programs on virtual networks, 59% of students did physical exercises, and 41% were inactive. The changes in the average physical activity of boys and girls in elementary school, middle school, and high school were significant ($p < 0.05$). Their average physical activity increased, and their light activity decreased significantly due to their participation in educational programs on virtual networks ($p < 0.05$).

Conclusion: The results showed that educational programs on virtual networks can have a positive effect on students' physical activity levels and weight. In similar conditions, online and virtual training play a significant role in advancing goals and ensuring the health and well-being of students during remote learning periods.

Keywords: *COVID-19 pandemic, physical activity, virtual networks, students, sports training.*

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1. Introduction

Inactivity increases the risk of developing chronic diseases in the post-COVID era (1, 2). The findings highlight a significant decrease in physical activity levels among different populations in Iran and an increase in sedentary behaviors during the COVID-19 crisis (3). The spread of viral diseases has limited children's outdoor activities and increased activities such as watching television and playing computer games (4), which can have many negative physical and psychological effects. Staying at home and not moving around brings with it the problem of obesity; a problem that leads to the occurrence of various diseases in the future of each individual (5). The findings of Arazi and Taati (2025), emphasize a significant decrease in physical activity levels in different population subgroups in Iran and an increase in sedentary behaviors during the COVID-19 (3). Playing and exercising, as an accessible and healthy approach, in addition to increasing the level of physical and mental health, vitality, improving physical fitness, helping with academic progress, and reducing depression, aggression, and stress (6), can also strengthen the immune system against disease (5).

Maintaining or increasing physical activity during diseases like COVID-19 is crucial to combat the dangerous consequences of sedentary behavior. During quarantine, doing sports at home has been recommended by various sports and health institutions; to commit and adhere to sports exercises, it is strongly recommended to choose invigorating activities (7). The closure of school sports and limiting the mobility of students can have many negative effects on their physical, mental, and social development. Playing and exercising, as an accessible and healthy approach, in addition to increasing the level of physical and mental health, vitality, improving physical fitness, helping with academic progress, and reducing depression, aggression, and stress (6), can also strengthen the immune system against disease (5). The health of students, as the future builders of the country, will play an important role in the country's future progress. Families play an important role in reducing the negative consequences of children's days at home. Children model many of their behaviors from their parents (8, 9). Kane et al. (2020) stated in a study titled "low physical activity during the COVID-19 pandemic outbreak" that 60% of people did not have enough physical activity during the outbreak of this virus in China. During the quarantine, more than half of the adults chose a sedentary lifestyle without physical activity, which brought many risks to the physiological health of individuals. Improving the level of exercise with the family at home can potentially help improve individuals' physical and mental health and is considered appropriate training for developing physical activity (10). Studies indicated that using an online class to motivate exercise can be useful (2, 11). Additionally, it was noted that one of the positive effects of the COVID-19 pandemic is the development and teaching of sports at home (7).

With the outbreak of COVID-19 pandemic, educational activities were offered to students through virtual networks, broadcasting, in-person activities, and the Shad system, but the educational, cultural, artistic, sports, and nurturing activities of schools, which play an effective role in the physical and mental health of students, have been affected by these conditions. Given the novelty of the online education method, it is impossible to comment on its overall quality and efficiency, and there is a need for research in this field. So far, no comprehensive study has been conducted in this area within the country, and the level of student participation in sports and extracurricular activities following educational programs on virtual networks has not been scientifically studied. This gap is particularly critical for educational policy and public health planning. The study seeks to inform more effective health-promoting educational strategies by identifying barriers and opportunities within current practices. Considering the importance of students' health as the future builders of the country and their effective role in the future of the country and the province, the present study examines the level of students' participation in sports and extracurricular activities following educational programs on virtual networks.

2. Methods and Materials

2.1 Study Design and Participants

The present study was a cross-sectional study in which, using a questionnaire, the level of participation of students in Guilan province in sports and extracurricular activities following participation in virtual network educational programs was examined. The statistical population of the present study was all boy and girl students in elementary school (boys: 71,707, girls: 70,646), middle school (boys: 47,124, girls: 45,293), and high school (boys: 42,051, girls: 42,322) in Guilan province. Given the vastness of Guilan province, using the stratified cluster sampling method, research samples were selected from the northern (Anzali, Khommam, Hawigh, Talesh), southern (Sangar, Rudbar,

Rahmatabad, Amarlu), eastern (Lahijan, Kouch-e-Safhan, Siahkal, Rudsar), and western (Foman, Soumeh-Sara, Masal, Shaft) regions of Guilan province and regions 1 and 2 of Rasht city. The desired number was selected randomly from each town according to the student density.

After determining the number of boy and girl students in Guilan province at each level, using the Morgan table, at least 382 boy and 382 girl students for the elementary level, 381 boy and 381 girl students for the middle school, and 381 boy and 381 girl students for high school level were selected from all over Guilan province. However, due to the existing conditions, limited research time, and lack of cooperation, 1035 questionnaires were filled out and collected by boys and 983 by girls.

The criteria for the subjects to enter the study included: 1—boys and girls in elementary school, middle school, and high school in Guilan province; 2—no physical disability; 3—no diseases that prevent physical activity. The participants' height and weight were self-reported, and their BMI was calculated using weight divided by height squared.

2.2 Educational programs in virtual networks

The educational programs included 2 months of 9 webinars by experienced professors from the province for boy and girl students in Guilan province and their parents and teachers. The webinars covered an active lifestyle, various exercises in closed environments, proper nutrition, physical activity and sports benefits, disease prevention, and weight loss.

2.3 International Physical Activity Questionnaire (IPAQ)

The data collection method was a virtual questionnaire using the Porsline website. Information was collected through the completion of a self-report questionnaire; demographic characteristics were recorded. Since the target population in this study was students, the questionnaires were completed under their supervision and with their help. The questionnaires were provided to the students through virtual networks and virtual groups of students in each city, with the help of teachers.

The questionnaire used was a short version of the IPAQ. This questionnaire was developed by an international expert group in Geneva in 1998, and its validity and reliability have been confirmed in 12 countries (12). This questionnaire has also been used in various studies in the country, and its validity and reliability have also been confirmed (13, 14).

The questionnaire used consisted of two parts: A) Demographic and contextual questions: This part will consist of 9 questions and students' information regarding age, height, weight, gender, educational level, and history of membership in sports clubs was evaluated. B) IPAQ questionnaire: The questions in this part were related to the individual's physical performance (physical activity in the past 7 days). According to the designed questionnaire, the pattern and intensity of activities in the past 7 days were determined. Activities such as aerobics, high-speed cycling, lifting heavy objects, digging (such as digging the garden), etc., which require more than six calories per minute, were considered vigorous physical activity. Activities such as volleyball, badminton, cleaning the room, carrying light loads, etc., which require 3-6 calories per minute, were considered moderate physical activity. Also, any activity that lasted less than 10 minutes was excluded. The energy intensity of the total activities in the past 7 days was calculated according to the IPAQ instructions (15).

The term metabolic equivalent (MET) is a unit for estimating the metabolic cost of physical activity. One MET is approximately equal to the energy expended at rest in an individual. Metabolic equivalents were first calculated for the listed physical activities. The MET equivalent was 3.3 for walking, 4 for moderate activity, and 8 for vigorous activity. These numbers were then multiplied by the duration of the listed physical activity in minutes and the number of days the activity was performed (16). If the total energy calculated during the week was between 0 and 599 met/cal/week, it was light physical activity, 600 to 3000 met/cal/week was moderate physical activity, and if it was more than 3000 met/cal/week, it was vigorous physical activity (15).

According to the IPAQ protocol (17-19):

1- Light physical activity: This is the lowest level of physical activity. Those who do not meet the criteria for categories 2 or 3 are considered inactive.

2- Moderate physical activity: Meets any of the following three criteria:

- 3 days or more of vigorous activity for at least 20 minutes per day
- 5 days or more of moderate-intensity activity or walking for at least 30 minutes per day
- 5 days or more of a combination of walking, moderate- or vigorous-intensity activities, totaling at least 600 METs (metabolic index) per minutes per week.

3- Vigorous physical activity: Meets any of the following criteria:

- Moderately vigorous activity for at least 3 days and a total of at least 3,000 METs per minute per week
- 7 days or more of a combination of walking, moderate-intensity, or vigorous-intensity activities at least 3,000 METs per minute per week

2.3.1 Validity of the research instrument

This questionnaire has been used in various studies in the country and its validity and reliability have been confirmed (13, 14). The validity and reliability of this questionnaire were conducted by Moghadam, et al. (2012) in Iran, where Cronbach's alpha was reported to be 0.7, indicating good internal consistency, and its reliability was reported to be 0.9 by Spearman-Brown correlation (20).

Table 1. Descriptive characteristics of the participants.

	Boys (1035)			Girls (983)		
	Elementary level	Middle School	High School	Elementary level	Middle School	High School
Age (years)	8.93 ± 1.61	13.14 ± 0.86	15.78 ± 1.83	9.26 ± 1.10	13.43 ± 0.73	16.20 ± 1.04
Height (cm)	132.04 ± 11.32	145.08 ± 18.65	166.38 ± 10.98	129.94 ± 9.10	140.82 ± 15.61	152.27 ± 16.76
Weight (kg)	33.84 ± 9.21	47.92 ± 17.66	68.01 ± 14.18	35.63 ± 19.20	40.38 ± 19.60	57.06 ± 15.36
BMI ($kg.m^{-2}$)	19.53 ± 2.81	22.8 ± 3.11	8.93 ± 1.61	20.70 ± 1.65	21.40 ± 2.91	24.23 ± 1.11

2.4 Data analysis

After collecting quantitative data through the questionnaire, the demographic characteristics of the variables were evaluated using descriptive statistical methods (frequency, frequency percentage, mean, standard deviation). The distribution of each variable was examined using the Kolmogorov–Smirnov test to ensure the normality of distribution. To investigate the effect of educational programs in virtual networks on the level of physical activity of students, a paired sample t-test was employed. Additionally, to compare the level of participation of boy and girl students in three educational levels, the ANOVA test and Tukey's post hoc test were used. Statistical significance was set at $P \leq 0.05$ for these analyses and data analysis was performed using SPSS version 26 and Excel 2021 software.

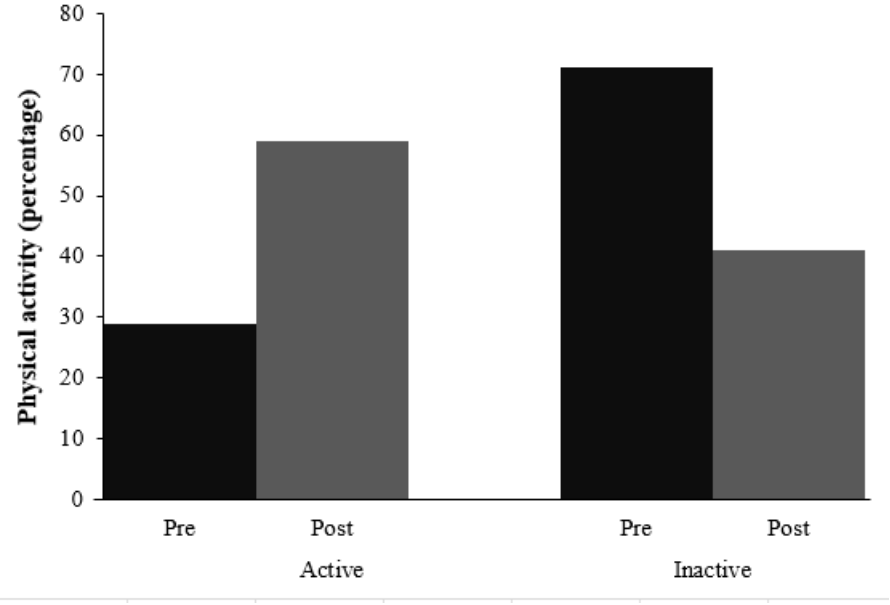

Figure 1. Physical activity of participants before and after the intervention.

3. Results

Table 1 shows the characteristics of the participants. The results showed that 71% of students did not engage in regular physical activity before participating in online sports activities, and only 29% had been physically active (Figure 1). Also, 12.5% of students engaged in regular physical activity one day a week, 8% two days a week, and 7% three

days a week. Table 2 shows the distribution of participants in different parts of the province.

As shown in Table 3, 51.8% of boys and 58.7% of girls were of normal weight before participating in social media sports activities, which increased to 60.16% in boys and 65.85% in girls after participating. The results also showed that 41% of boys and 35.5% of girls were overweight and obese, which decreased to 33.5% in boys and 28.15% in girls after participating in these activities (Table 3).

Table 2. Frequency distribution of respondents by geographical region

		North	South	East	West	Center
Boys (1035)	Elementary level (342)	67	64	61	68	86
	Middle School (341)	64	61	65	66	85
	High School (351)	70	62	63	65	91
	Total	201	187	189	194	262
Girls (983)	Elementary level (329)	62	59	60	63	85
	Middle School (327)	58	63	63	59	84
	High School (327)	66	57	61	60	83
	Total	186	179	184	182	252

The results of the paired t-test showed that the changes in the moderate physical activity of elementary school, middle school and high school boy students were significant (P = 0.02, P = 0.01, P = 0.02; respectively) and their physical activity level increased, and their light activity level decreased significantly as a result of participating in physical activity on virtual networks (P = 0.02, P = 0.01, P = 0.01; respectively). Changes in vigorous physical activity were not significant in the three levels of school (P = 0.10, P = 0.09, P = 0.14; respectively) (Figure 2). In addition, the changes in the moderate physical activity of girls' students in elementary school, middle school and high school were significant (P = 0.02, P = 0.03, P = 0.01; respectively); their average physical activity level increased and their light activity level decreased significantly as a result of participating in physical activities on virtual networks (P = 0.02, P = 0.02, P = 0.01; respectively). Changes in vigorous physical activity were significant in elementary school (P = 0.04), but no significant changes were observed in middle school and high school (P = 0.16, P = 0.11; respectively) (Figure 2).

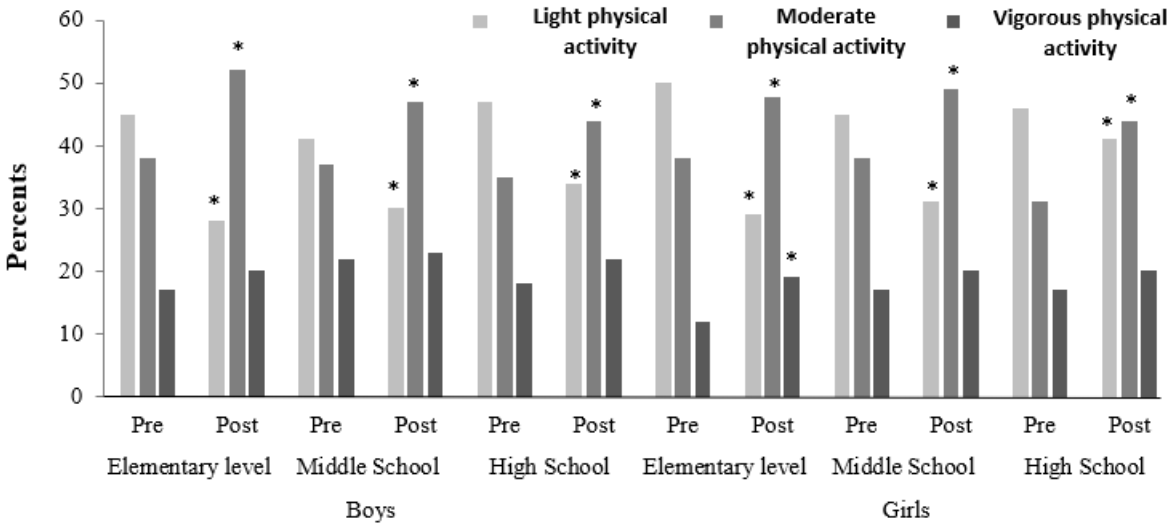

Figure 2. Percentage of students' physical activity pre and post by group. * denotes significant differences between pre and post-testing values ($p \leq 0.05$).

According to the results of the ANOVA test, there is a significant difference between the participation rate of boy students in the three levels of elementary school, middle school and high school (P = 0.001, F = 17.52). Using the Tukey post-hoc test, it was determined that there is a significant difference between the participation rate of boy students in elementary school and middle school, and high school, and between the participation rate of boy students middle school and high school (P = 0.001, P = 0.002, P = 0.003; respectively) (Figure 3).

Table 3. BMI of students pre and post intervention.

BMI	Boys		Girls	
	Pre	Post	Pre	Post
Thin and very thin (%)	7.2	6.34	5.8	5
Normal weight (%)	51.8	60.16	58.7	65.85
Overweight (%)	18	17	16	14.35
Obese (%)	23	16.5	19.5	13.8

According to the results of the ANOVA test, there is a significant difference between the participation rate of girls' students in the three levels of elementary school, middle school and high school (P = 0.001, F = 9.99). There is a significant difference between the participation rate of girls' students in elementary school compared to middle school and high school in Guilan province in physical activities following participation in virtual network educational programs (P = 0.001, P = 0.002). However, there is no significant difference between the participation rate of girls' students in the middle school compared to the high school (P = 0.09) (Figure 3).

The study's results showed a significant difference between the participation rate of boy and girl students in Guilan province in physical activities following educational programs on virtual networks. The participation rate of girls was higher than that of boys in the three elementary, middle, and high school levels (P = 0.001, F = 38.21) (Figure 3).

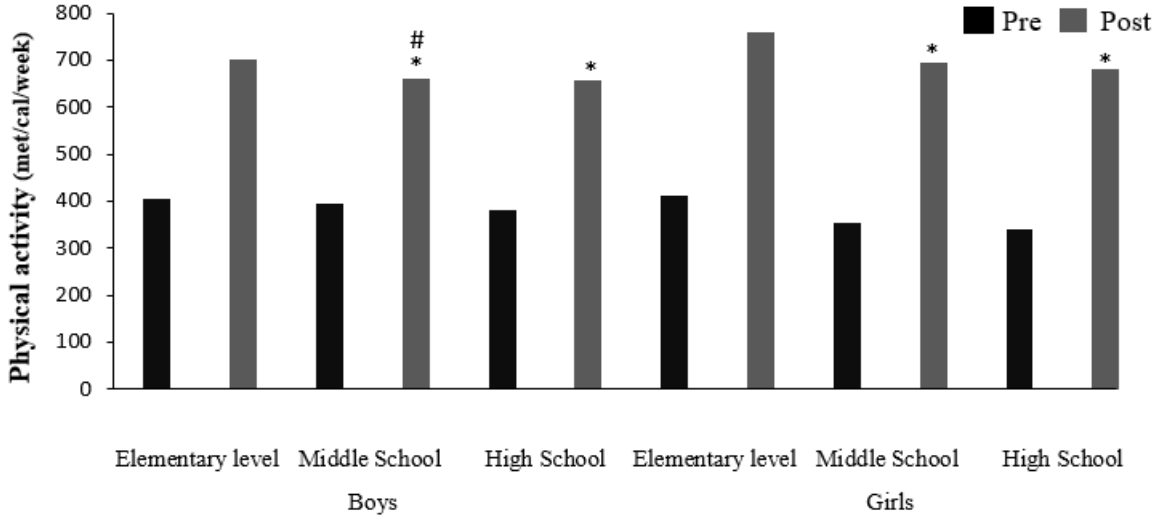

Figure 3. Physical activity: met/cal/week pre and post by group. *denotes significant differences from elementary level students. #denotes significant differences from second high school students ($p \leq 0.05$).

4. Discussion and Conclusion

The results of the present study showed that 71% of students did not engage in regular physical activity before participating in sports activities following educational programs on virtual networks. After participating in sports activities on virtual networks, 41% were inactive. The changes in the average physical activity of male and female students in elementary school, middle school and high school were significant.

The study results showed that 51.8% of boys and 58.7% of girls had a normal weight before participating in sports activities on virtual networks, which increased to 60.16% in boys and 65.85% in girls after participating in these

activities. The results also showed that 41% of boys and 35.5% of girls were overweight and obese, which decreased to 33.5% in boys and 28.15% in girls after participating in these activities. Similarly, Li et al. reported that BMI increased among Chinese students both during and after the quarantine period (21). Also, Takaya et al. also indicated that elementary school students gained weight during the quarantine period. They stated that the quarantine implemented during the COVID-19 pandemic had an adverse effect on weight gain, especially in young school-age children (22). Many studies have reported that COVID-19 lockdowns have led to weight gain and increased obesity in adults and children (23-27). Prolonged lockdowns negatively impact the health and well-being of school-age children. Children were unable to attend school as a result of the lockdown and were forced to refrain from sports or other physical activities. Therefore, the lockdown led to obesity in some children. These findings are consistent with previous studies on the impact of summer vacation on weight (28, 29).

Students, as one of the most dynamic social groups, have power and energy on the one hand and different desires, feelings and emotions on the other hand. By placing this power and energy in an appropriate direction, they can find a worthy response to their legitimate desires and witness their talents, creativity, and personality development flourishing. This can be achieved by spending their free time appropriately (30). To develop and expand sports, we need promotion and encouragement. Expanding and participating in the development of sports is possible without motivation. To achieve this goal, the media must identify the correct and rational motivations of the audience. The audience will not watch a program unless it attracts them. The media and virtual programs have an effective role in changing the attitude of the people of the society towards sports, and the more this role is carried out with consideration of such considerations as recognizing needs, effective communication methods and psychological approaches, the more effective it will be. Some scientific evidence shows that watching television programs is one of students' first or second priorities (31, 32). Since students are the future builders and the main foundations of a healthy and advanced society, paying attention to their physical and mental health is of particular importance and plays a key role, and considering the necessity of developing sports in the public, championship and professional sectors, it seems that student sports play a very decisive role in building support in the sectors mentioned above. The status of the media is an important part of cultural activity, and building culture in the field of sports in leisure time is one of the necessities of society, considering its role in the physical and mental health of individuals, especially students, which unfortunately has received less attention and needs more reflection (30). According to the research, it can be stated that spending leisure time appropriately, especially by doing sports and physical activity, has a positive effect on the body, mind, and psyche of adolescents and young people. Consequently, correct attitudes are created in them, and while they benefit from its personal and social benefits, it can lead to their academic progress and success. To promote sports, social media and television programs can be utilized, as they constitute individuals' most important leisure activity (33, 34).

The COVID-19 pandemic outbreak has brought about extensive changes to the education system. In this regard, Crawford et al. (2020) have stated that to synchronize all industries with online training, it is necessary to develop specific strategies so that industries do not face problems and the development of training programs can be carried out quickly (35). Amin (2020) concluded in his study titled Psychology of Fear about the COVID-19 pandemic that due to the creation of an uncertain environment in the world, even medical staff and specialists are facing a psychological fear of the COVID-19 pandemic, and this fear has also had irreparable effects on their physiological conditions (36). Naricci et al. (2020) stated in their study that the quarantine caused by the spread of the COVID-19 pandemic and the lack of physical activity during this period have put people's physiological health at risk and have increased the incidence of neuromuscular and cardiovascular diseases and obesity. In contrast, staying active during these conditions helps people improve their immune system (37). Jacobson et al. (2020) stated in their review that physical activity is necessary in these conditions and that people must be active to prevent chronic diseases (2).

Given the novelty of online education, it is not yet possible to comment on the overall quality and efficiency of this method and more research is needed. Online education is also used in many industries in the field of education through existing programs such as Google Meet. The COVID-19 pandemic has changed how millions of people worldwide teach and learn; innovation in education can lead to many ways to deal with the COVID-19 pandemic crisis. Given the digital divide, new changes in education approaches can be problematic. The outbreak of the COVID-19 pandemic has changed education in three ways. In the first case, it can be said that the pressure of the situation leads

to innovation. For example, in many countries, educational classes are held on television networks. In the second case, public and private educational partnerships can be mentioned. In a short time, learning communities are forming, with the beneficiaries including governments, publishers, education professionals, technology providers and network operators using digital platforms as a temporary solution. In third-world countries where education is primarily government-funded, this could become a desirable trend for online education in the future. Third, the digital divide in some countries is noteworthy; 60% of the world has the necessary infrastructure for online education, but the remaining 40% are compelled to abandon educational activities due to this method of education (2, 7, 10, 11).

Naricci et al. (2020) stated that the quarantine caused by the spread of the COVID-19 pandemic and the lack of physical activity during this period have put people's physiological health at risk and have increased the incidence of neuromuscular and cardiovascular diseases. In contrast, staying active during these conditions helps people improve their immune system. Inactivity during this period leads to loss of muscle mass and muscle damage. These adverse effects of inactivity can be reduced by exercise. However, moderate and high-intensity resistance training can positively affect a person's physiological conditions at home and without the need for advanced equipment (37). Jacobson et al. (2020) stated that staying active and performing physical activities greatly helps prevent chronic diseases (2).

In line with the results of the present study, Kang et al. (2020) reported that physical activity levels among Japanese students decreased during the COVID-19 pandemic. They noted that increased physical activity at home was associated with more stable mood states; maintaining an active lifestyle could help reduce students' anger, fatigue, and depression, and create positive emotional states during the COVID-19 pandemic (38). Also, the results of Dunton et al. (2020) showed that short-term changes in physical activity in response to COVID-19 may increase the risk of obesity, diabetes, and heart disease in children (9). Ravali and Musumaki (2020) also noted the importance of promoting exercise at home and its positive effects on individuals in Italy (1). In addition, Jacobsen et al. (2020) stated that physical activity is very important for maintaining the body's immunity and staying active helps to prevent chronic diseases. They also noted that using an online class to motivate exercise can be useful (2). Quinn et al. (2020) stated that 60% of people did not have enough physical activity during the virus outbreak in China. During the quarantine, more than half of the adults chose a sedentary lifestyle and no physical activity, which brought many risks to the physiological health of individuals. Improving the level of exercise with the family at home can potentially help improve individuals' physical and mental health and is considered a suitable training for developing physical activity (10). Hamami et al. (2020) stated that one of the positive effects of the COVID-19 pandemic is the development and training of exercise at home. This creates physical motivation and is an effective strategy to keep young people active at home (7). Basilaia and Kovádz (2020) in their study on online education during the COVID-19 pandemic stated that, according to the statistics provided in one Hungarian school, the shift from traditional to electronic education has been very successful. They noted that some infrastructure is necessary to increase the success of e-learning (11). Similar to the current research results, the research shows that physical activity has decreased during the COVID-19 pandemic. Health-related risks have increased, and virtual exercise programs during this disease can increase physical activity and improve health.

This study had limitations. One was self-reporting of height and weight. Additionally, the physical activity questionnaire was provided to participants remotely and was self-reported. The questionnaires were distributed to students through online networks and groups in each city, with help from teachers. They were completed under supervision and with parental assistance. There is a potential that parental and teacher opinions influenced the responses.

Virtual classes and social networks can facilitate participation in specific behaviors, such as sports activities, by offering approval, encouragement, advice, guidance, or by providing appropriate facilities and opportunities. Findings show that social networks have a positive impact on individuals' perceptions of opportunities and how to participate in sports activities during their free time. Social networks have an important impact on their participation in sports activities through the support they provide to individuals (32). Some studies have emphasized the role of social networks, such as school or peer groups, in learning specific behaviors, such as participating in sports activities (33). Providing the necessary support and training in this area is one of the main conditions for more people to participate in sports activities. Also, proper training in sports movements and the necessary recommendations for performing movements using available equipment, under the supervision of physical education coaches and teachers, is one of the effective factors in people's participation in sports

activities. Sports teachers can play a positive role in increasing students' sports activities through virtual networks and online classes in three dimensions: problem-solving support (guidance and assistance in learning sports exercises), emotional support (encouragement to participate in sports activities), and support based on companionship for participation in sports activities (33, 34).

The results of this study showed that engaging in sports activities after educational programs on virtual networks can significantly boost physical activity among male and female students in Guilan province. Additionally, the percentage of boys and girls who were overweight or obese decreased following participation in these activities. Mass media policies and programs will play a vital role in promoting the development of sports in students' free time. Currently, due to present conditions, online and virtual education are crucial in achieving goals and ensuring students' health and well-being.

Authors' Contributions

Conceptualization and methodology: H.A. Data collection, Formal analysis, investigation and original draft preparation: E.E. and A.S.K. Writing - review and editing: H.A. Supervision: H.A. All authors read and approved the final manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

1. Ravalli S, Musumeci G. Coronavirus outbreak in Italy: physiological benefits of home-based exercise during pandemic. 2020;5(2):31. [PMID: 33467247] [PMCID: PMC7739427] [DOI]
2. Jakobsson J, Malm C, Furberg M, Ekelund U, Svensson M. Physical activity during the coronavirus (COVID-19) pandemic: prevention of a decline in metabolic and immunological functions. Frontiers in Sports and Active Living. 2020;2:57. [PMID: 33345048] [PMCID: PMC7739799] [DOI]
3. Arazi H, Taati B. Impact of coronavirus (COVID-19) pandemic on physical activity levels in different sub-populations of Iranians: a national survey. Scientific Reports. 2025;15(1):3140. [PMID: 39856100] [PMCID: PMC11761063] [DOI]
4. Dziewior J, Carr LJ, Pierce GL, Whitaker K. College students report less physical activity and more sedentary behavior during the COVID-19 pandemic. Journal of american college HealtH. 2024;72(7):2022-30. [PMID: 35881778] [DOI]
5. Shirvani H, Rostamkhani F. Exercise considerations during coronavirus disease 2019 (COVID-19) Outbreak: A narrative review. Journal of Military Medicine. 2020;22(2):161-8.
6. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public health reports. 1985;100(2):126. [PMID: 3920711]
7. Hammami A, Harrabi B, Mohr M, Krustrup P. Physical activity and coronavirus disease 2019 (COVID-19): specific recommendations for home-based physical training. Managing Sport and Leisure. 2022;27(1-2):26-31. [DOI]
8. Wang G, Zhang Y, Zhao J, Zhang J, Jiang F. Mitigate the effects of home confinement on children during the COVID-19 outbreak. The Lancet. 2020;395(10228):945-7. [PMID: 32145186] [DOI]
9. Dunton GF, Do B, Wang SD. Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the US. BMC public health. 2020;20:1-13. [PMID: 32887592] [PMCID: PMC7472405] [DOI]
10. 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. International journal of environmental research and public health. 2020;17(14):5170. [PMID: 32709003] [PMCID: PMC7399902] [DOI]
11. Basilaia G, Kvavadze D. Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. Pedagogical Research. 2020;5(4). [DOI]
12. Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, et al. International physical activity questionnaire: 12-country reliability and validity. Med sci sports Exerc. 2003;195(9131/03):3508-1381. [PMID: 12900694] [DOI]
13. Hazavehei SMM, Asadi Z, Hassanzadeh A, Shekarchizadeh P. Comparing the effect of two methods of presenting physical education 2 course on the attitudes and practices of female students towards regular physical activity in Isfahan University of Medical Sciences. Iranian Journal of Medical Education. 2008;8(1):121-31.
14. Estebsari F, Shojaizadeh D, Mostafayi D, Farahbakhsh M. Designing and intervention educational to increase physical

activity for students girl based on PRECEDE Model to Improve physical activity in female students. Hayat. 2010;16(1):48-54.
15. solhi m, zinat motlagh f, karimzade shirazi k, taghdisi mh, jalilian f. Designing and Implementing Educational Programs to Promote Physical Activity Among Students: An Application of the Theory of Planned Behavior. Internal Medicine Today. 2012;18(1):45-52. [PMCID: A-10-540-1]
16. Gjerdingen DK, Froberg DG, Chaloner KM, McGovern PM. Changes in women's physical health during the first postpartum year. Archives of Family Medicine. 1993;2(3):277-83. [PMID: 8252148] [DOI]
17. Melton B, Marshall E, Bland H, Schmidt M, Guion WK. A merican rural women's exercise self-efficacy and awareness of exercise benefits and safety during pregnancy. Nursing & health sciences. 2013;15(4):468-73. [PMID: 23663292] [DOI]
18. Hagströmer M, Oja P, Sjöström M. The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. Public health nutrition. 2006;9(6):755-62. [PMID: 16925881] [DOI]
19. Maddison R, Ni Mhurchu C, Jiang Y, Vander Hoorn S, Rodgers A, Lawes CM, et al. International physical activity questionnaire (IPAQ) and New Zealand physical activity questionnaire (NZPAQ): a doubly labelled water validation. International Journal of Behavioral Nutrition and Physical Activity. 2007;4:1-9. [PMID: 18053188] [PMCID: PMC2219963] [DOI]
20. Moghaddam MB, Aghdam FB, Jafarabadi MA, Allahverdipour H, Nikookheslat SD, Safarpour S. The Iranian Version of International Physical Activity Questionnaire (IPAQ) in Iran: content and construct validity, factor structure, internal consistency and stability. World Appl Sci J. 2012;18(8):1073-80.
21. Li H, Song Y, Wang Y, Feng X, Li C, Peng J, et al. Impact of the COVID-19 pandemic lockdown on Body Mass Index: a three-year follow up study in 6,156 Chinese college students. Frontiers in Endocrinology. 2024;Volume 15 - 2024. [PMID: 38966211] [PMCID: PMC11222588] [DOI]
22. Takaya J, Higashino H, Takaya R, Sakaguchi H, Tanoue J, Higashide T, et al. Effect of the COVID-19 pandemic lockdown on the physique of school-age children in Japan. Annals of Pediatric Endocrinology & Metabolism. 2023;28(2):124-30. [PMID: 37401057] [PMCID: PMC10329943] [DOI]
23. Eisenburger N, Friesen D, Haas F, Klaudius M, Schmidt L, Vandeven S, et al. weight management of children and adolescents with obesity during the COVID-19 pandemic in Germany. PLoS One. 2022;17(4):e0267601. [PMID: 35486630] [PMCID: PMC9053772] [DOI]
24. Rundle A, Park Y, Herbstman J, Kinsey E, COVID YW. 19-Related School Closings and Risk of Weight Gain Among Children., 2020, 28. DOI: https://doi org/101002/oby.22813:1008-9. [PMID: 32227671] [PMCID: PMC7440663] [DOI]
25. Woolford SJ, Sidell M, Li X, Else V, Young DR, Resnicow K, et al. Changes in body mass index among children and adolescents during the COVID-19 pandemic. Jama. 2021;326(14):1434-6. [PMID: 34448817] [PMCID: PMC8511973] [DOI]
26. Lin AL, Vittinghoff E, Olgin JE, Pletcher MJ, Marcus GM. Body weight changes during pandemic-related shelter-in-place in a longitudinal cohort study. JAMA network open. 2021;4(3):e212536-e. [PMID: 33749764] [PMCID: PMC7985720] [DOI]
27. Nishijima C, Miyagawa N, Tsuboyama-Kasaoka N, Chiba T, Miyachi M. Association between lifestyle changes and at-home hours during and after the state of emergency due to the COVID-19 pandemic in Japan. Nutrients. 2021;13(8):2698. [PMID: 34444858] [PMCID: PMC8398728] [DOI]
28. von Hippel PT, Workman J. From kindergarten through second grade, US children's obesity prevalence grows only during summer vacations. Obesity. 2016;24(11):2296-300. [PMID: 27804271] [DOI]
29. Moreno JP, Johnston CA, Woehler D. Changes in weight over the school year and summer vacation: results of a 5-year longitudinal study. Journal of School Health. 2013;83(7):473-7. [PMID: 23782089] [DOI]
30. Nixon HL. Social network analysis of sport: Emphasizing social structure in sport sociology. Sociology of Sport Journal. 1993;10(3):315-21. [DOI]
31. Colley RC, Janssen I, Tremblay MS. Daily step target to measure adherence to physical activity guidelines in children. Medicine & Science in Sports & Exercise. 2012;44(5):977-82. [PMID: 22051570] [DOI]
32. Henderson KA, Ainsworth BE. The connections between social support and women's physical activity involvement: The Cultural Activity Participation Study. Women in Sport and Physical Activity Journal. 2000;9(2):27-53. [DOI]
33. Calvó-Armengol A, Patacchini E, Zenou Y. Peer effects and social networks in education. The review of economic studies. 2009;76(4):1239-67. [DOI]
34. BashiriMoosavi F, Farmanbar R, Taghdisi M, AtrkarRoshan Z. Level of physical activity among girl high school students in Tarom county and relevant factors. Iranian Journal of Health Education and Health Promotion. 2015;3(2):133-40.
35. Crawford J, Butler-Henderson K, Rudolph J, Malkawi B, Glowatz M, Burton R, et al. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. Journal of applied learning & teaching. 2020;3(1):1-20. [DOI]
36. Amin S. The psychology of coronavirus fear: Are healthcare professionals suffering from corona-phobia? International Journal of Healthcare Management. 2020;13(3):249-56. [DOI]
37. Narici M, Vito GD, Franchi M, Paoli A, Moro T, Marcolin G, et al. Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health: Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures. European journal of sport science. 2021;21(4):614-35. [PMID: 32394816] [DOI]
38. Kang S, Sun Y, Zhang X, Sun F, Wang B, Zhu W. Is physical activity associated with mental health among Chinese adolescents during isolation in COVID-19 pandemic? Journal of epidemiology and global health. 2021;11(1):26-33. [PMID: 32959611] [PMCID: PMC7958283] [DOI]