

ORIGINAL RESEARCH

Changes in physical activity trends and the health status in south Korean adult males before and during the COVID-19 pandemic

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Abstract

This study aims to investigate changes in physical activity and health trends before and during the COVID-19 pandemic in Korea using data from the 2019, 2020, and 2021 Korea National Sports Participation Survey (KNSPS). A total of 15,656 adult males (5487 people in 2019, 4791 people in 2020, and 5378 people in 2021) were selected for this research. Descriptive statistical analysis, chi-square test, and one-way analysis of variance were performed. In this study, we revealed changes in sports activities, participation levels, health and fitness status perception, and health and fitness maintenance factors of Korean adults before and after the COVID-19 pandemic. Specifically, the participation rate in outdoor sports activities, such as walking, gate ball, golf, and fishing has increased compared to before the COVID-19 outbreak. On the other hand, the participation rate of indoor sports activities, such as bodybuilding, swimming, yoga, and Pilates showed a decreasing trend. Participation period, frequency, and intensity, which evaluate the level of sports participation, also showed significant differences during COVID-19, but as the sports participation levels have not changed regularly, it cannot be attributed to COVID-19. Finally, health and fitness status perception were found to be worse after the COVID-19 outbreak than before. In addition, the rate of considering regular physical activity participation as a factor to maintain health and fitness after the COVID-19 outbreak increased. The results of this study can be used as basic data to recognize the impact of the pandemic on our lives and promote healthy and regular physical activity in preparation for any pandemic that may occur in the future.

Keywords

Sports participation; Sports events; Health; Korea national sports participation survey; COVID-19

1. Introduction

In March 2020, the World Health Organization (WHO) in line with the COVID-19 pandemic declaration recommended governments of each country to practice “social distancing” as a countermeasure to slow the spread of COVID-19 [1]. Countries with stronger government control entered a “lock-down” period that halted all social systems [2]. The severity of the lockdown varied between countries and regions, limiting the space and time people could be active. Some countries even banned outdoor activities where there was a high risk of infection.

These measures affected people's occupations, education, travel, recreation, and physical activity level [3]. In particular, due to the nature of COVID-19, the virus spread through respiratory droplet transmission [4], therefore sports facilities available to citizens were closed, and mega-sporting events, such as the 2020 Tokyo Olympics and the 2022 Hangzhou Asian Games, were postponed [5].

After the COVID-19 outbreak, sports organizations attempted to adapt to the new situation, but this was not successful due to lockdowns *etc.* [6]. Because of the long-lasting global pandemic, our lives have changed immeasurably and it is impossible to return to the pre-COVID-19 outbreak. People have experienced difficulties in participating sports due to the COVID-19 pandemic. It is important to recognize the role of sport in good health. Participating in physical activity is an excellent way to improve health and fitness. Research shows that physical activity is positively related to several desirable outcomes, including social contentedness, physical health and mental health [3].

However, many experts have concerned that physical activity restrictions due to COVID-19 can cause serious health problems [7]. A study of adults in Australia after the COVID-19 outbreak [8] presented poor results on the relationship between COVID-19 and physical activity, sleep, alcohol, and smoking. In other words, elevated smoking and alcohol consumption are related to decreased physical activity due to COVID-19 and

symptoms of depression, anxiety, and stress. In addition, as the public health policy of COVID-19 is prolonged, the risk of obesity and cardiovascular disease has increased due to a reduction in the time spent walking and an increase in the time spent sitting in the population [9–11].

In Korea, social distancing was implemented in March 2020, public sports facilities were closed in May 2020, and the physical activity participation rate in 2020 decreased by –6.5%, from 66.6% to 60.1%, compared with 2019. This resulted in the closure of public sports facilities and strict social distancing measures, such as limiting the number of people indoors and prohibiting the gathering of groups of people. As a result, participation in indoor sports activities, such as bodybuilding and swimming, decreased, while outdoor sports activities, such as mountain climbing and golf, increased. However, after November 2021, in accordance with global trends, Korea also declared a “living with coronavirus” program and did not impose restrictions on any sports facility, so the type of physical activity and the degree of participation are expected to change.

Therefore, this study aims to investigate the sports participation trends and Korean adults’ health status in the years 2019, 2020, and 2021. This is because the COVID-19 outbreak not only directly affected health, but the restriction of physical activity due to social distancing had other important impacts on people’s quality of life and health. In the meantime, many studies have been conducted to explore the effect of the COVID-19 pandemic on physical activity and health. However, little research has been conducted to empirically analyze whether there are changes in what sports people do due to COVID-19 or whether people’s perceptions related to health have changed.

The following hypotheses were proposed:

H1: There are changes in the sports activities that Korean adults participate in before the COVID-19 pandemic outbreak (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021).

H2: There are changes in the level of sports participation among Korean adults according to before the COVID-19 pandemic outbreak (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021).

H3: There are changes in the perception of health and fitness status among Korean adults according to before the COVID-19 pandemic outbreak (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021).

H4: There are changes in maintenance factors of health and fitness among Korean adults according to before the COVID-19 pandemic outbreak (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021).

2. Materials and Methods

2.1 Design and Procedure

The raw data used in this study are the 2019, 2020, and 2021 Korea National Sports Participation Survey (KNSPS). KNSPS is an annual survey on participation in daily sports published by the Ministry of Culture, Sports and Tourism (MCST) of Korea. This provides sports policy data that can promote the participation rate and maximize participation satisfaction in

sports. The survey period is between September to November every year, and Korean citizens aged 10 years and older are used as the population. For sampling, 9000 people (one person in 9000 households) were selected as the target sample. To be specific, 9000 people were selected each year by using the 2017, 2018, and 2019 register-based census survey results by mixing the stratified sampling and multi-leveled cluster sampling methods. The survey method was conducted in the form of one-on-one home visits in which the interviewer directly visited the sampled households. The survey was conducted using structured questionnaires on the perception of health and physical fitness and the status of participation in sports activities.

2.2 Measures

This study aimed to investigate changes in physical activity trends and health status of Korean adult males before the COVID-19 pandemic (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). As seen in Table 1, respondents in 2019, 2020, and 2021 were set as independent variables. In this study, the school-age population, participants vulnerable to economic activities under the age of 20 years, and participants in events with less than 30 regular participants were excluded from the 9000 respondents in the 2019, 2020, and 2021 surveys.

TABLE 1. Rate of Korean adult males’ regular participation in sports activities by year (2019–2021).

| Variable | N ¹ | % |
|-------------|----------------|------|
| Respondents | | |
| 2019 | 5487/9000 | 61.0 |
| 2020 | 4791/9000 | 53.2 |
| 2021 | 5378/9000 | 59.8 |

¹N: Number.

As dependent variables, sports participation event, sports participation degree (period, frequency, intensity), health and fitness maintenance factors, and health and fitness status were set. First, walking and jogging, gate ball, fishing, billiards, hiking, badminton, fitness, bowling, swimming, aerobics, yoga and Pilates, cycle, gymnastics, football, table tennis, and tennis were selected as analysis data. The degree of sports participation was composed of the “period”, “frequency”, and “intensity”. The participants were asked about the period of sports participation in the last year in a closed format, and the questionnaire consisted of 12 answers ranging from less than 1 month to 12 months. Frequency was assessed through a closed-type question about the number of times a person participated in sports and consisted of seven questions ranging from less than once a week to every day. Intensity was assessed through a closed-ended question about how frequent one participates in a sport once and consisted of three items: low intensity, medium intensity, and high intensity. Health and fitness maintenance factors were evaluated through “regular physical activity”, “sufficient rest and sleep”, “regular meals and nutritional supplements”, and “no drinking and smoking

status” questions. Finally, subjective health and fitness status was evaluated on a 5-point Likert scale of not good at all, not very good, average, good, and very good.

2.3 Data Analysis

The data reconstructed for this study from the original data of 2019, 2020, and 2021 KNSPS were statistically processed using SPSS (WIN 26.0, IBM, New York, USA). A chi-square test was conducted to examine the differences in sports participation and health and fitness maintenance factors according to respondents in 2019, 2020, and 2021. In addition, a one-way analysis of variance was conducted to investigate the difference between the degree of sports participation (period, frequency, intensity) and subjective health and fitness status according to respondents in 2019, 2020, and 2021.

3. Results

3.1 Changes in Physical Activity Trends

3.1.1 Changes in Sports Activities

Table 2 shows the changes in sports events that Korean adults participated in before the COVID-19 pandemic outbreak (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). Comparing the data before and after the COVID-19 pandemic outbreak, the sport with the largest decrease in the participation rate was swimming. The rate of swimming was 7.6% in 2019, 5.1% in 2020, and 3.9% in 2021, reducing the number of participants to half the level before the pandemic. Participation levels also decreased in bodybuilding and aerobics; bodybuilding decreased from 14.6% to 11.5%, and aerobics decreased from 1.3% to 1.0%. On the other hand, walking, gate ball, golf, fishing, and table tennis are sports whose numbers continuously increased before, during, and in the adaptation process of the pandemic; in walking (39.4% in 2019 increased to 39.8% in 2020 and to 40.5% in 2021), gate ball (0.6% in 2019 increased to 0.9% in 2020 and 1.1% in 2021), golf (4.1% in 2019 increased to 5.0% in 2020 and to 6.4% in 2021), fishing (0.8% in 2019 increased to 0.9% in 2020 and 1.1% in 2021), and table tennis (1.2% in 2019 increased to 1.7% in 2020 and to 1.8% in 2021), the number of participants increased compared to before the pandemic. Analyzing the events with an increase in participants showed the overall characteristics of outdoor sports. Other events showed fluctuating trends that neither increased nor decreased consistently. This is presumably influenced by social distancing as part of South Korea’s control policy against COVID-19.

3.1.2 Changes in the Level of Sports Participation

Table 3 shows the changes in the degree of sports participation for Korean adults before the outbreak of the COVID-19 pandemic (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). The sports participation period according to year ($F = 42.848$) showed a statistically significant difference ($p < 0.001$). In the case of the sports participation period, 2020 ($M = 8.80$), 2021 ($M = 8.43$), and 2019 ($M = 8.18$), the duration of sports participation in the

past year was long. Participation frequency ($F = 22.184$) was found to be statistically significant ($p < 0.001$). For sports participation frequency, 2019 ($M = 2.85$) and 2020 ($M = 2.81$) were higher than 2021 ($M = 2.64$). Finally, the sports participation intensity ($F = 31.641$) also showed a statistically significant difference ($p < 0.001$); 2021 ($M = 1.87$) showed higher sports participation intensity than 2019 ($M = 1.79$) and 2020 ($M = 1.79$).

3.2 Changes in Health Status

3.2.1 Changes in the Perception of Health and Fitness Status

Table 4 shows the changes in the perception of health and fitness status of Korean adults before the outbreak of the COVID-19 pandemic (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). Health status perception ($F = 42.803$) was statistically significant at a $p < 0.001$ level. Specifically, health status awareness was better in 2019 and 2020 than in 2021 ($M = 3.80$, $M = 3.83$, $M = 3.70$, respectively). Physical state recognition ($F = 46.469$) showed a statistically significant difference at $p < 0.001$. The perception of physical condition was better in 2019 and 2020 than in 2021 ($M = 3.63$, $M = 3.66$, $M = 3.52$, respectively), as in the perception of the health condition.

3.2.2 Changes in Health and Fitness Maintenance Factors

Table 5 shows changes in health maintenance factors considered by Korean adults before the outbreak of the COVID-19 pandemic (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). Before the pandemic (2019), regular meals and nutritional supplements (45.8%) were the most common health maintenance factors for Korean adults, followed by enough rest and sleep (31.2%), regular physical activity (20.6%), and no drinking and smoking (2.4%). This trend changed at the beginning of the pandemic and the adaptation process for regular physical activity (20.6% in 2019 increased to 21.9% in 2020 and to 23.9% in 2021), and enough rest and sleep (31.2% in 2019 increased to 34.1% in 2020 and to 35.9% in 2021). The number of people who thought regular physical activity and enough rest and sleep were important health maintenance factors increased. On the other hand, regular meals and nutritional supplements were 45.8% in 2019, 42.0% in 2020 and 37.7% in 2021, a decrease of about 8% compared with that before the pandemic.

Table 6 shows changes in fitness maintenance factors considered by Korean adults before the outbreak of the COVID-19 pandemic (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). Before the pandemic (2019), regular meals and nutritional supplements (35.6%) were the most common factors for maintaining physical strength among Korean adults, followed by regular physical activity (33.7%), enough rest and sleep (28.7%), and no drinking and smoking (2.0%). However, distinct changes were observed at the beginning of the pandemic (2020) and in the adaptation process (2021). After the COVID-19 pandemic, the proportion of Korean adults who answered that regular physical activity is more important

TABLE 2. Changes in sports activities by year (2019–2021).

| Variables | 2019 | | 2020 | | 2021 | |
|---|------|---------|------|------------------------|------|------|
| | N | % | N | % | N | % |
| Sports | | | | | | |
| Walking (jogging, trotting) | 2162 | 39.4 | 1906 | 39.8 | 2177 | 40.5 |
| Gate ball | 35 | 0.6 | 44 | 0.9 | 58 | 1.1 |
| Golf (including ground and park golf) | 227 | 4.1 | 239 | 5.0 | 343 | 6.4 |
| Fishing | 42 | 0.8 | 42 | 0.9 | 61 | 1.1 |
| Billiards, pool | 96 | 1.7 | 166 | 3.5 | 138 | 2.6 |
| Mountain climbing | 426 | 7.8 | 407 | 8.5 | 394 | 7.3 |
| Badminton | 99 | 1.8 | 84 | 1.8 | 137 | 2.5 |
| Bodybuilding (working out at a gym) | 802 | 14.6 | 625 | 13.0 | 618 | 11.5 |
| Bowling | 90 | 1.6 | 109 | 2.3 | 105 | 2.0 |
| Swimming | 415 | 7.6 | 244 | 5.1 | 211 | 3.9 |
| Aerobics | 72 | 1.3 | 57 | 1.2 | 55 | 1.0 |
| Yoga, Pilates, tae-bo | 355 | 6.5 | 281 | 5.9 | 366 | 6.8 |
| Bicycling, cycling, mountain biking | 177 | 3.2 | 142 | 3.0 | 202 | 3.8 |
| Gymnastics (bare-handed, gymnastics, life gymnastics) | 167 | 3.0 | 159 | 3.3 | 151 | 2.8 |
| Soccer, futsal | 195 | 3.6 | 150 | 3.1 | 203 | 3.8 |
| Table Tennis | 68 | 1.2 | 82 | 1.7 | 99 | 1.8 |
| Tennis | 59 | 1.1 | 54 | 1.1 | 60 | 1.1 |
| Total | 5487 | 100 | 4791 | 100 | 5378 | 100 |
| | | Value | df | Asympt. Sig. (2-sided) | | |
| Chi-Square | | 197.834 | 32 | 0.000 | | |
| Likelihood Ratio | | 196.849 | 32 | 0.000 | | |
| Linear by Linear Association | | 6.353 | 1 | 0.012 | | |
| N of Valid Cases | | 15,656 | | | | |

TABLE 3. Changes in the level of sports participation by year (2019–2021).

| Variable | N | M ¹ | SD ² | F ³ | post-hoc |
|-----------|------|----------------|-----------------|----------------|--------------------|
| Period | | | | | |
| 2019 | 5487 | 8.18 | 3.434 | | |
| 2020 | 4791 | 8.80 | 3.434 | 42.848*** | 2019 < 2021 < 2020 |
| 2021 | 5378 | 8.43 | 3.374 | | |
| Frequency | | | | | |
| 2019 | 5487 | 2.85 | 1.752 | | |
| 2020 | 4791 | 2.81 | 1.743 | 22.184*** | 2021 < 2020, 2019 |
| 2021 | 5378 | 2.64 | 1.643 | | |
| Intensity | | | | | |
| 2019 | 5487 | 1.79 | 0.601 | | |
| 2020 | 4791 | 1.79 | 0.631 | 31.641*** | 2019, 2020 < 2021 |
| 2021 | 5378 | 1.87 | 0.643 | | |

*** $p < 0.001$; ¹M: Mean; ²SD: Standard Deviation; ³F: F-value.

TABLE 4. Changes in the perception of health and fitness status by year (2019–2021).

| Variable | N | M | SD | F | <i>post-hoc</i> |
|------------------------------|------|------|-------|-----------|-------------------|
| Perception of health status | | | | | |
| 2019 | 5487 | 3.80 | 0.762 | | |
| 2020 | 4791 | 3.83 | 0.775 | 42.803*** | 2021 < 2019, 2020 |
| 2021 | 5378 | 3.70 | 0.792 | | |
| Perception of fitness status | | | | | |
| 2019 | 5487 | 3.63 | 0.761 | | |
| 2020 | 4791 | 3.66 | 0.792 | 46.469*** | 2021 < 2019, 2020 |
| 2021 | 5378 | 3.52 | 0.812 | | |

*** $p < 0.001$.

TABLE 5. Changes in health maintenance factors by year (2019–2021).

| Variable | 2019 | 2020 | 2021 |
|---|--------------|--------------|------------------------|
| Health maintenance factors | | | |
| Regular physical activity | 1132 (20.6%) | 1049 (21.9%) | 1286 (23.9%) |
| Enough rest and sleep | 1712 (31.2%) | 1632 (34.1%) | 1932 (35.9%) |
| Regular meals and nutritional supplements | 2513 (45.8%) | 2013 (42.0%) | 2026 (37.7%) |
| No drinking and smoking | 130 (2.4%) | 97 (2.0%) | 134 (2.5%) |
| Total | 5487 (100%) | 4791 (100%) | 5378 (100%) |
| | Value | df | Asympt. Sig. (2-sided) |
| Chi-Square | 77.108 | 6 | 0.000 |
| Likelihood Ratio | 77.342 | 6 | 0.000 |
| Linear-by-Linear Association | 50.301 | 1 | 0.000 |
| N of Valid Cases | 15,656 | | |

TABLE 6. Changes in fitness maintenance factors by year (2019–2021).

| Variable | 2019 | 2020 | 2021 |
|---|--------------|--------------|------------------------|
| Fitness maintenance factors | | | |
| Regular physical activity | 1849 (33.7%) | 1991 (41.6%) | 2456 (45.7%) |
| Enough rest and sleep | 1573 (28.7%) | 1350 (28.2%) | 1441 (26.8%) |
| Regular meals and nutritional supplements | 1953 (35.6%) | 1344 (28.1%) | 1328 (24.7%) |
| No drinking and smoking | 112 (2.0%) | 106 (2.2%) | 153 (2.8%) |
| Total | 5487 (100%) | 4791 (100%) | 5378 (100%) |
| | Value | df | Asympt. Sig. (2-sided) |
| Chi-Square | 226.041 | 6 | 0.000 |
| Likelihood Ratio | 225.980 | 6 | 0.000 |
| Linear-by-Linear Association | 156.048 | 1 | 0.000 |
| N of Valid Cases | 15,656 | | |

than other factors to maintain health has increased.

The proportion of adults that regularly participate in physical activity as a factor for maintaining physical strength was 33.7% in 2019, 41.5% in 2020 and 45.7% in 2021, which increased by 12.0% compared to that before the pandemic. On the other hand, the proportion of respondents who answered that they had enough rest and sleep, regular meals and nutritional

supplements as factors for maintaining physical strength decreased; enough rest and sleep was 28.7% in 2019, 28.2% in 2020, 26.8% in 2021, and regular meals and nutritional supplements were 35.6% in 2019, 28.1% in 2020, 24.7% in 2021, decreasing by about 2.0% and 11.0%, respectively. This can be interpreted as an increase in the awareness of the need for regular physical activity as a factor in maintaining physical

fitness considered by Korean adults after the pandemic.

4. Discussion

This study analyzed data from the 2019, 2020, and 2021 KNSPS. The trends in physical activity and changes in health status perception of Korean adult males were investigated before the outbreak of COVID-19 (2019), at the beginning of the pandemic (2020), and during the adaptation process (2021). There were 5487 respondents (61.0%) in 2019, 4791 (53.2%) in 2020, and 5378 (59.5%) in 2021 who participated in sports activities at least once a week for 30 minutes or more. This shows that the sports participation rate decreased by 7.8% in 2020 compared with 2019, but returned to pre-COVID levels in 2021. This is consistent with study results showing that the participation rate in sports activities decreased after the COVID-19 outbreak in most countries due to policies that restricted physical activity through social distancing [12–16]. However, some studies reported no significant difference in sports participation rate or intensity before and after the COVID-19 outbreak [17, 18]. The COVID-19 pandemic did not affect participation in sports as much as we expected, and people who had been participating in sports activities for a long time continued despite the pandemic. The change in sports participation rates may be due to differences in COVID-19 response policies implemented by countries and regions [19, 20]. The COVID-19 pandemic affected physical activity and health status, but policies responding to COVID-19 also greatly impacted physical activity [21, 22].

This study provides a better understanding of changes in sports activity participation and health status during the pandemic in Korea. After the COVID-19 outbreak, participation in outdoor sports activities, such as walking and jogging, gate ball, and golf, increased. On the other hand, participation in indoor sports activities, such as bodybuilding, swimming, and aerobics, decreased. These results are similar to a study comparing Korean sports participation before (2019) and after (2020) the COVID-19 outbreak [23]. Notably, the participation rate increased in 2021, when more people were adapting to COVID-19, compared with 2020, when COVID-19 started. Badminton, yoga, and Pilates are representative indoor sports, but the participation rate in 2021 increased compared to 2020. This may be explained by the social distancing policy in the early stages of COVID-19 changing over time and the relaxation of restrictions on indoor sports.

In addition, for the duration, frequency, and intensity indicating the level of sports participation, there was a significant difference between 2019, 2020, and 2021. However, contrary to the results expected before designing the study, Korean adults' sports participation level did not change because of COVID-19, as there was no increasing or decreasing trend in any specific year analyzed. However, according to a study investigating leisure time sports and exercise (LTSE) in Germany after the outbreak of COVID-19 [24], when the German government closed sports facilities, including fitness centers, sports activity time and participation rate in sports among Germans declined. In addition, there was a change from participation in high-intensity sports activities to participation in low-intensity sports activities and there were concerns that

this change could lead to a decrease in cardiorespiratory function. For this reason, maintaining a certain level of duration, frequency, and intensity of participation in sports is a very important factor in improving health [25, 26].

Second, Korean adults' subjective health and fitness status was lower in 2021 than in 2019 and 2020. Although COVID-19 directly harms health, policies to prevent the spread of COVID-19 to others, such as social distancing, have a negative impact on their physical and mental health. In particular, COVID-19 response policies, such as self-isolation, gathering bans, and telecommuting, can prevent the spread of COVID-19 but can worsen physical and mental health by lowering immunity and cardiorespiratory function and increasing depression and stress [27–30]. The results of this study indicate that health and physical condition perceptions have changed negatively compared to before the outbreak of COVID-19; hence, the long-term pandemic may have had a negative effect on the perceptions of health conditions [31, 32]. Lastly, before the outbreak of COVID-19, regular meals and nutritional supplements were the most common health and stamina maintenance factors, but these factors continued to decrease during the pandemic. In contrast, regular physical activity has increased, and awareness of the importance of physical activity has increased over the pandemic.

The raw data used in this study, KNSPS, is reliable data collected by the Korean Ministry of Culture, Sports, and Tourism every year. In addition, the sample was selected considering the age of Korean adults. Therefore, the results of this study can generalize the sports events that Korean adults participate in before and after COVID-19, health & fitness status perception, and health & fitness maintenance factors. However, since this study was conducted based on data surveyed on Korean adults, it is difficult to make inferences about youth in twenty-year-old or younger and about sports participation and health in other countries.

5. Conclusions

Unlike previous studies, this study investigated the trends in sports participation and health status of Korean adults in 2019, before the COVID-19 outbreak, 2020, when strict social distancing was enforced, and in 2021, when regulations were lifted and society entered the adaptation stage. Furthermore, this study was reliable since it used research data from the 2019, 2020 and 2021 KNSPS directly collected by the Korean government, that is, microdata, which consist of sets of records containing personal information.

In 2020, when COVID-19 was prevalent, each country had a different response, and the Korean government attempted to prevent the spread of COVID-19 with a strict social distancing policy. However, the number of confirmed COVID-19 cases is approaching almost 100,000 in Korea per day. COVID-19 is now a part of our daily life. Accordingly, in 2021 when society entered the adaptation stage of COVID-19, the trend of sports activities in Korea changed, unlike in 2019 and 2020, and outdoor sports and new types of indoor sports gained popularity. In addition, this study indicated that Korean people recognized regular physical activity as a more important factor in maintaining health and physical fitness in 2021 than

in 2019 and 2020. In conclusion, this study provides a better understanding of changes in sports activity participation and health status during the pandemic in Korea.

There is a possibility of future pandemics caused not only by similar types of COVID-19 but also by different types of infectious diseases in the future. Therefore, in future research, as the pandemic continues, it is necessary to establish a physical activity policy in preparation for another pandemic.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available upon request from the authors. Some variables are restricted to preserve anonymity of the study participants.

AUTHOR CONTRIBUTIONS

IYC and SYR—Design; SYR, KJJ and IYC—methodology & formal analysis; KJJ and SYR—writing-original draft preparation; KJJ and IYC—writing-review and editing. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the Institutional Review Board (Number: 113003) of the Korea Ministry of Culture, Sports and Tourism. The participants provided informed consent and agreed to publication of this research.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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