Perceived Physical and Mental Health and Healthy Eating Habits During the COVID-19 Pandemic in Korea

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic has disrupted the lives of people around the world since 2020. This study aims to reveal perceived impact of the coronavirus pandemic on physical and mental health and eating behaviors among people with disabilities and without disabilities in South Korea, as compared to other countries.

Methods: A secondary analysis of a prospective cross-sectional study which was conducted with a web-based global survey.

Results: Among the 3,550 responses from 65 countries, 2,621 responses with nation information were set as full data, 189 for South Korea and 2,432 for other countries. In Korea, there was no significant difference in healthy lifestyle behaviors between people with and without disabilities before the COVID-19 pandemic. Perceived physical and mental health and changes in eating habits during the COVID-19 pandemic showed no significant difference between people with and without disabilities in Korea. There were significant differences in physical health and dietary habits, but no differences in its effect on mental health between
people living in Korea and other countries in both people with and without disabilities groups. In other words, more than 60% of people in all groups (disability vs. non-disability, Korea vs. non-Korea) reported worse mental health than before the COVID-19 pandemic. **Conclusion:** In Korea and other countries, mental health showed a tendency to deteriorate regardless of the presence or absence of disability during the COVID-19 pandemic. In terms of healthy eating habits, Koreans were relatively less affected than people from other countries. **Keywords:** COVID-19; People with Disabilities; Healthy Lifestyles; Lack of Physical Activity; Mental Health

**INTRODUCTION**

COVID-19 hit the world in early 2020, and the COVID-19 pandemic disrupted the everyday life of people worldwide for over two years. The negative effects of COVID-19 pandemic were decreased physical activity, increased screen time, sedentariness, weight gain, poor mental health, and financial problems. COVID-19 restrictions affected vulnerable groups, such as people with physical or intellectual disabilities, more severely. Over 90% reported a negative impact on mental health, and 61% reported a reduction in physical activity levels. Additionally, healthcare accessibility and access to facilities in the disabled community were decreased, leading to a risk of isolation. South Korea is said to have coped relatively well with the pandemic. Comparing the death toll, South Korea, the United States, and the United Kingdom have 60.56, 2,378.07, and 2,127.16 deaths per million, respectively, up to November 2021. In addition, South Korea became one of the first high-income countries to see its economy recover to pre-pandemic levels in the first quarter of 2021 (the second-best performance behind China). Naturally, various policies have been criticized, and as the situation continues to change, policies continue to evolve.

Various reports, including problems caused by the COVID-19 pandemic, are frequently reported in Korea. A recent article stated that middle and high school students from Daegu (the city that first experienced the rapid spread of the Coronavirus in Korea) experienced lots of mental difficulties such as depression and anxiety. Another cross-sectional study demonstrated that about 20% of people are at a high level of traumatic stress, depression, anxiety, and suicidal risk. Similar results were shown in Busan that 30% had depression, and about 22% showed anxiety in a study with a self-reported questionnaire. It has also been suggested that there has been enormous psychological burden on frontline healthcare workers during the COVID-19 pandemic.

However, most Korean reports were cross-sectional studies, so they represented the current situation, but the comparison to the situation before the pandemic was not clear. In addition, there were data from groups such as the general people and healthcare workers but reports on the physical and mental effects on people with disabilities were rare.

Active members of the International Society for Physical and Rehabilitation Medicine (ISPRM) Task Force on Physical Activity for Persons with Disabilities designed a global survey to determine the impact of the COVID-19 pandemic on perceived physical activity levels, mental health, and healthy eating habits in community-dwelling persons with
disabilities, as compared to those without disabilities. The data collected revealed that self-reported health-related behaviors, including physical health, mental health, and healthy eating habits, were worse in those with disabilities compared to those without disabilities (unpublished data). This study was a secondary study of the above study and was conducted to determine the effects of the COVID-19 pandemic on the perceived physical and mental health and healthy eating habits of the persons with and without disability in Korea compared to those of other countries.

**METHODS**

**Setting and participants**
The survey questionnaire, including several demographic factors, current functioning and disability, activities and participation, physical activity levels, mental health, and eating habits, were developed, and translated into six official World Health Organization (WHO) languages and Korean. Active members of the International Society of Physical and Rehabilitation Medicine (ISPRM) Task Force on Physical Activity for Persons with Disabilities members designed the questionnaire and reviewed the translations in each language. The survey was done on the community-dwelling adults through e-mail, social networking platforms and a link on the ISPRM.

**Statistical analysis**
Descriptive quantitative statistics were used for data analysis. A $\chi^2$ test was used to compare the difference among groups (with and without disabilities, Korea and other countries). All statistical tests were performed using R for Windows software (R Foundation for Statistical Computing, Vienna, Austria). $P < 0.05$ was set as the level of significance. For analysis, the degree of disability was classified only as presence or absence, unlike the previous study.

**Ethics statement**
The study was approved by the Human Research Protection Program Institutional Review Boards at the Yale School of Public Health under protocol 45CFR46.104. Informed consent was submitted by all subjects when they answered the survey.

**RESULTS**
The survey was administered from September 25 to December 31 in 2020. In total, 3,550 responses were collected from 65 countries. For this analysis, 2,621 responses with information on nationality were set as full data, 189 for South Korea and 2,432 for other countries. Values excluding country information were used for analysis as much as possible, so the total was slightly different for each item.

**Demographic factors**
There was a difference in demographic factors between South Korea and other countries (Table 1). In Korea, the proportion of male respondents were higher (44%) than in other countries (14%). In Korea, people in their 40’s accounted for the largest age group, but those aged 25–39 were the highest in other countries. Both groups showed a high educational level, with more than 90% having a college degree. In terms of employment, the percentage of students and unemployed people were low in Korea compared to other countries.
Pre-pandemic healthy lifestyle behaviors
Pre-pandemic healthy lifestyle behaviors such as frequencies of physical exercise ≥30 min, sufficient fruit and vegetable consumption (≥5 servings), and sleep hours (≥7 hours) showed no significant difference between people with and without disabilities in Korea (Table 2).

Perceived physical and mental health and eating habit change during the COVID-19 pandemic
Perceived physical and mental health and eating habit change showed no significant difference between people with and without disabilities in Korea (Table 3). In total, 49% reported similar perceived physical health, and 63.4% retained similar eating habits during the COVID-19 pandemic in Korea. However, 44% of Koreans reported that their physical health was worse than before the COVID-19 pandemic, and 66% reported their mental health was unhealthier than before the COVID-19 pandemic.

### Table 1. Demographic factors of survey respondents

| Variables               | Korea | Others |
|-------------------------|-------|--------|
|                         | Disabled | Not disabled | Disabled | Not disabled |
| Sex                     |         |         |         |         |
| Female                  | 26 (55.32) | 80 (56.34) | 1,218 (88.78) | 880 (83.02) |
| Male                    | 21 (44.68) | 62 (43.66) | 154 (11.22) | 180 (16.98) |
| Age group, yr           |         |         |         |         |
| 18–24                   | 0 (0.00) | 6 (4.23) | 33 (2.41) | 25 (2.36) |
| 25–39                   | 11 (23.40) | 56 (39.44) | 787 (57.36) | 571 (53.87) |
| 40–60                   | 28 (59.57) | 68 (47.89) | 481 (35.06) | 408 (38.49) |
| > 60                    | 8 (17.02) | 12 (8.45) | 71 (5.17) | 56 (5.28) |
| Education               |         |         |         |         |
| Postgraduate            | 10 (21.28) | 56 (39.44) | 922 (67.20) | 704 (66.42) |
| Bachelor or equivalent  | 34 (72.34) | 82 (57.75) | 381 (27.77) | 334 (31.51) |
| Secondary/middle or high school | 2 (4.26) | 4 (2.82) | 63 (4.59) | 22 (2.08) |
| Primary/elementary school | 1 (2.13) | 0 (0.00) | 3 (0.22) | 0 (0.00) |
| No school               | 0 (0.00) | 0 (0.00) | 3 (0.22) | 0 (0.00) |
| Employment              |         |         |         |         |
| Employed (part-time or full-time) | 33 (70.21) | 124 (87.32) | 1,116 (81.34) | 903 (85.19) |
| Housewife/homemaker     | 7 (14.89) | 5 (3.52) | 80 (5.83) | 35 (3.30) |
| Retired                 | 6 (12.77) | 10 (7.04) | 59 (4.30) | 37 (3.49) |
| Student                 | 0 (0.00) | 2 (1.41) | 64 (4.66) | 53 (5.00) |
| Unemployed              | 1 (2.13) | 1 (0.70) | 53 (3.86) | 32 (3.02) |

Values are presented as number (%).

### Table 2. Pre-pandemic healthy lifestyle behaviors in people with and without disabilities in Korea

| Category                              | Frequency | Disabled | Not disabled | P value |
|---------------------------------------|-----------|----------|--------------|---------|
| Physical exercise ≥30 min             |           |          |              |         |
| > 4 days/wk                           | 6 (12.77) | 21 (14.79) |              |         |
| 0–1 days/wk                           | 12 (25.53) | 33 (23.24) |              |         |
| 2–4 days/wk                           | 19 (40.43) | 69 (48.59) |              |         |
| None                                  | 10 (21.28) | 19 (13.38) |              | 0.548   |
| Fruit and vegetable intake ≥5 servings|           |          |              |         |
| > 4 days/wk                           | 12 (25.53) | 41 (28.87) |              |         |
| 0–1 days/wk                           | 7 (14.89) | 26 (18.31) |              |         |
| 2–4 days/wk                           | 26 (55.32) | 73 (51.41) |              |         |
| None                                  | 2 (4.26) | 2 (1.41) |              | 0.608   |
| Sleep ≥7 hr                           |           |          |              |         |
| > 4 days/wk                           | 16 (34.04) | 51 (35.92) |              |         |
| 0–1 days/wk                           | 7 (14.89) | 29 (20.42) |              |         |
| 2–4 days/wk                           | 19 (40.43) | 58 (40.85) |              |         |
| None                                  | 5 (10.64) | 4 (2.82) |              | 0.162   |

Total 47 142

Values are presented as number (%).
More people from other countries reported that their physical health was worse than before the pandemic than Koreans in both disabled and not disabled groups (Table 4). In terms of mental health, more than 60% of people reported worsening in both Korea and other countries. Three-quarters of Koreans with disabilities maintained the same eating habits. However, it improved in other countries, remained similar, or worsened, accounting for about one-third in each group.

**DISCUSSION**

A decrease in physical activity is one of the most cited effects of the COVID-19 pandemic could be attributed to lockdown periods. In Korea, although sports centers were closed and working from home was recommended for several weeks in 2020, perceived physical health was largely maintained compared to other countries. This might be because outdoor activities were permitted while wearing a mask, and home exercise using online programs became popular. Since a self-report survey was conducted rather than objective observations, responses may differ depending on socio-cultural backgrounds.

However, mental strain was a global phenomenon. Most respondents reported that their mental health was strained compared to before the pandemic. Lockdowns, quarantine, social distancing, and wearing masks in public were widespread impacts of the COVID-19 pandemic. All these may have interrupted social communication and led to social isolation. Loneliness and social isolation frequently co-occur, and loneliness has several adverse impacts on mental health. Therefore, using devices such as smartphones to enable interaction with people and to maintain relationships with close people such as family members were essential in the current context.
situation where the end was uncertain. In addition, we need policies to pay attention to mental health and social isolation and to supplement it socially and institutionally.

In Korea, healthy eating habits were largely maintained during the COVID-19 crisis compared to other countries. In a study from China, about 30% reported an increased frequency of vegetable and fruit intake after the outbreak of COVID-19. However, Ammar et al. reported that meal patterns became unhealthier during confinement. The type of food, eating out of control, having a snack between meals, or a late-night snack was significantly increased during the COVID-19 home confinement period.

In the case of healthy eating habits, different results can come out depending on the country and interpretation of the question. In this study, questions attributed to healthy eating habits recommended by the WHO were investigated, recommendations of 5 portions per day of fruit and vegetable consumption to prevent non-communicable diseases, and several micronutrient deficiencies. In Korea, another possible reason for maintaining usual eating habits was that there were no significant difficulties in buying food or necessities or hoarding for about two years, except a shortage of masks in early 2020. As the time spent at home increased, non-face-to-face shopping was preferred, and online shopping sales increased by an average of 20–30% in Korea.

The results in Korea differed from the main results of the original study, which suggests that COVID-19 had an outsized impact on healthy behaviors in people with disabilities compared to those without disabilities (unpublished data). People with disabilities were more likely to report worsening physical and mental health and dietary habits when compared to pre-pandemic levels. However, in Korea, there was no difference between people with disabilities and those without disabilities in their perceived physical and mental health and healthy eating habit changes in this study. It was an unexpected result as there is a known gap in health-related quality of life between people with and without disability in Korea. It was observed that people without disabilities reported worse physical health and eating habit in people without disabilities compared to people with disabilities in Korea (Table 3). This result is probably because people without disabilities were more active before the Pandemic. The first reason for the different results might be the limited number of respondents in Korea. Therefore, the difference between the disabled and the non-disabled might not have been perceived. Secondly, since most of the subjects had a high education background and were employed in both disabled and non-disabled populations, the results of this study should be viewed as study limitation. However, this study is meaningful as there are scarce reports on the impact of COVID-19 in people with disabilities in Korea.

This study showed the effect of the COVID 19 epidemic on physical and mental health and eating habits in those with and without disabilities in Korea. It was possible to compare its impact with other countries. In Korea, it can be concluded that mental health was significantly affected regardless of the presence or absence of disability rather than physical health or a healthy diet.

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REFERENCES

1. Pears M, Kola-Palmer S, De Azevedo LB. The impact of sitting time and physical activity on mental health during COVID-19 lockdown. *Sport Sci Health* 2022;18:179-91.

2. Pancani L, Marinucci M, Aureli N, Riva P. Forced social isolation and mental health: a study on 1,006 Italians under COVID-19 lockdown. *Front Psychol* 2021;12:663799.

3. Lee EPX, Man REK, Gan TLA, Fenwick EK, Aravindhan A, Ho KC, et al. The longitudinal psychological, physical activity, and financial impact of a COVID-19 lockdown on older adults in Singapore: the PIONEER-COVID population-based study. *Int J Geriatr Psychiatry*. Forthcoming 2021. DOI: 10.1002/gps.5645.

4. Abate Daga F, Agostino S, Peretti S, Beratto L. The impact of physical activity rate on subjective well-being among North-Western Italian population during COVID-19 nationwide lockdown. *J Sports Med Phys Fitness*. Forthcoming 2021. DOI: 10.23736/S0022-4707.21.12787-2.

5. Hwang TJ, Rabheru K, Peisah C, Reichman W, Ikeda M. Loneliness and social isolation during the COVID-19 pandemic. *Int Psychogeriatr* 2020;32(10):1217-20.

6. Hu Z, Lin X, Chiwanda Kaminga A, Xu H. Impact of the COVID-19 epidemic on lifestyle behaviors and their association with subjective well-being among the general population in Mainland China: cross-sectional study. *J Med Internet Res* 2020;22(8):e21176.

7. Kim SJ, Lee S, Han H, Jung J, Yang SJ, Shin Y. Parental mental health and children’s behaviors and media usage during COVID-19-related school closures. *J Korean Med Sci* 2021;36(25):e184.

8. Theis N, Campbell N, De Leeuw J, Owen M, Schenke KC. The effects of COVID-19 restrictions on physical activity and mental health of children and young adults with physical and/or intellectual disabilities. *Disabil Health J* 2021;14(3):101064.

9. Senjam SS. Impact of COVID-19 pandemic on people living with visual disability. *Indian J Ophthalmol* 2020;68(7):1367-70.

10. Lund EM, Forber-Pratt AJ, Wilson C, Mona LR. The COVID-19 pandemic, stress, and trauma in the disability community: a call to action. *Rehabil Psychol* 2020;65(4):313-22.

11. U.S. Food & Drug Administration. *South Korea’s Response to COVID-19*. Silver Spring, MD, USA: U.S. Food & Drug Administration; 2021.

12. Sridhar D. *What the UK Can Learn from South Korea’s COVID Response*. London, UK: The Guardian; 2021.

13. Jang W, Kim B, Kim ES, Song KH, Lee MJ, et al. Are the current guidelines sufficient to establish infection control strategies for COVID-19 related issues in hospitals? *J Korean Med Sci* 2021;36(50):e343.

14. Yun KW, Kim KM, Kim YK, Kim MS, Kwon H, Han MS, et al. Limited benefit of facility isolation and the rationale for home care in children with mild COVID-19. *J Korean Med Sci* 2021;36(5):e445.

15. Kim JM, Yoo JH, Cho HK, Hong ST. Analysis of PubMed and KoreaMed indexed Korean publications on COVID-19. *J Korean Med Sci* 2021;36(49):e345.

16. Lee H, Noh Y, Seo JY, Park SH, Kim MH, Won S. Impact of the COVID-19 pandemic on the mental health of adolescent students in Daegu, Korea. *J Korean Med Sci* 2021;36(46):e321.

17. Ko M, Cho HM, Park J, Chi S, Han C, Yi HS, et al. Impact of the coronavirus disease pandemic on mental health among local residents in Korea: a cross sectional study. *J Korean Med Sci* 2021;36(46):e322.

18. Kim DM, Bang YR, Kim JH, Park JH. The prevalence of depression, anxiety and associated factors among the general public during COVID-19 pandemic: a cross-sectional study in Korea. *J Korean Med Sci* 2021;36(29):e214.
19. Jang OJ, Chung YI, Lee JW, Kim HC, Seo JS. Emotional distress of the COVID-19 cluster infection on health care workers working at a national hospital in Korea. J Korean Med Sci 2021;36(47):e324. [PUBMED] [CROSSREF]

20. Lee HA, Ahn MH, Byun S, Lee HK, Kweon YS, Chung S, et al. How COVID-19 affected healthcare workers in the hospital locked down due to early COVID-19 cases in Korea. J Korean Med Sci 2021;36(47):e325. [PUBMED] [CROSSREF]

21. Ammar A, Brach M, Trabelsi K, Chotourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 international online survey. Nutrients 2020;12(6):1583. [PUBMED] [CROSSREF]

22. WHO Regional Office for Europe. Promoting Fruit and Vegetable Consumption. Copenhagen, Denmark: WHO Regional Office for Europe; 2022.

23. Jang I. Changes in consumption patterns due to COVID-19. KISDI Perspect 2021;2(1):1-12.

24. Baek MK, Kim YS, Kim EY, Kim AJ, Choi WJ. Health-related quality of life in Korean adults with hearing impairment: the Korea National Health and Nutrition Examination Survey 2010 to 2012. PLoS One 2016;11(10):e0163999. [PUBMED] [CROSSREF]

25. Kim SJ, Kang KA. Meaning of life for adolescents with a physical disability in Korea. J Adv Nurs 2003;43(2):145-55. [PUBMED] [CROSSREF]

26. Lee K, So WY. Differences in the levels of physical activity, mental health, and quality of life of elderly Koreans with activity-limiting disabilities. Int J Environ Res Public Health 2019;16(15):2736. [PUBMED] [CROSSREF]

27. Lee Y, Hong I, Lee MJ, Park HY. Identifying risk of depressive symptoms in adults with physical disabilities receiving rehabilitation services: propensity score approaches. Am Rehabil Med 2019;43(3):250-61. [PUBMED] [CROSSREF]

28. Lee JS, Kim SW, Lee SH, Kim JC, Choi JB, Cho SY, et al. Factors affecting quality of life among spinal cord injury patients in Korea. Int Neurourol J 2016;20(4):316-20. [PUBMED] [CROSSREF]